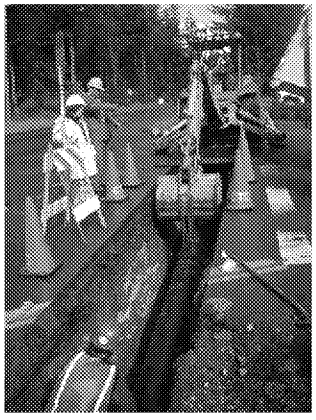
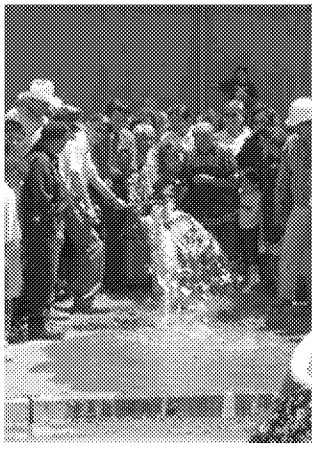
Version Date February 1, 2013





INDIAN HEALTH SERVICE

SFC
PROJECT MANAGEMENT
PROGRAM (PMPro)

PROJECT MANAGEMENT GUIDELINE

For Planning, Designing, and Constructing SFC Projects

OFFICE OF ENVIRONMENTAL HEALTH AND ENGINEERING
Division of Sanitation Facilities Construction

Working Draft – February 1, 2013

About the SFC Project Management Guideline

The purpose of the Project Management Guideline is to provide a broad and thorough exploration of the discipline of project management as it relates to the Division of Sanitation Facilities Construction. These guidelines have been developed for all levels of personnel, from entry-level field staff to upper-level management. While it is recognized that many SFC personnel have developed their own approaches to project management, it is also recognized that continuous learning, innovation, and sharing of best practices are the marks of a successful organization.

"**Formal project management is part of the SFC culture**" is one of the visions for the SFC program is that. This guideline is designed to help make that statement a reality.

Acknowledgements

This guideline is the work product of an extensive and collaborative effort by two working groups of dedicated SFC project managers.

The initial group, the vision element VE 9 Team, was led by Jason Lovett (Portland) and comprised of Christen Glime (Albuquerque), David Johnson (California), Craig Larson (Bemidji), Jim Magnuson (Navajo), Krista Pihlaja (Aberdeen), Richard Racine (Billings), Phil Rapp (Nashville), and Richard Thayer (Alaska). Special gratitude is owed to Steven Scherling (Bemidji) for joining the team at a time of need. His enthusiasm propelled the VE 9 Team forward and his graphics are a great addition to the guideline.

The successor group, the vision element VE 9-2C Team, was led by David Johnson (Aberdeen) and comprised of Kurt Kesteloot (Navajo), James Ludington (Headquarters), and Steven Scherling (Bemidji). Kevin Bingley (Alaska), Jason Crownholm (Phoenix), and Zack Stanley (Nashville) also contributed.

Special appreciation is extended to members of the SFC Core Team past and present including Carole Boerner (Billings), Ronald Ferguson (Headquarters), Kelly Titensor (Portland), Scott Helgeson (Nashville), Mitch Constant (Albuquerque), Dan Heintzman (EHSC), Craig Morin (Bemidji), and Colleen Yazzie (EHSC). Both teams sincerely appreciate their steadfast support of the SFC strategic planning effort and this project management effort.

The teams would like to thank Dana Baer for his advocacy, guidance, stewardship, and encouragement throughout the life of both teams. The teams would also like to thank Rob Ziegler of IHI Environmental for his work. His ability to help find clarity amidst the chaos of great ideas has helped make this guideline and the Project Management Program possible.

The full endorsement of the project management recommendations by the senior SFC management has made this effort particularly fulfilling and will ensure effective project management throughout the SFC program.

Forward

This guideline is a work product of the Indian Health Service Sanitation Facilities Construction (SFC) Program strategic plan. The strategic plan was developed through a facilitated process in which SFC Directors and mid-level managers proposed and prioritized several "vision elements" and goals for improvement. The Directors formed several vision element implementation teams to bring about important improvements. Each team was charged to work on a specific vision element. This guideline was prepared by the Vision Element #9 and #9-2C Teams whose charge was to make "Formal project management is part of the SFC culture" a true statement. The document describes refinements to the SFC project management practice necessary to realize the vision element. The guideline will likely to continue to evolve as the SFC program improves the professional practice of project management.

Throughout their work, the vision element teams have been cognizant of the fundamental tie between effective project management and the success of the SFC program. The SFC program is a project-driven organization that supports the IHS mission through the completion of water, wastewater, and solid waste projects. SFC engineers have always been first and foremost project managers but this has often been unrecognized. The identity of practitioners in the SFC program has typically been proudly and justifiably tied to professional and technical engineering skills. While sound technical skills are critical to the SFC program, they are only one skill set required of a well-rounded SFC project manager.

This guideline is intended to be consistent with the existing SFC Criteria Manual Version 1.01, 3/13/03, Part 5, Chapter 2 of the Indian Health Manual, the current SDS Guidelines, and other policies and statutes that guide the delivery of the SFC program. In the event a practice recommendation in this document conflicts with SFC policy, the policy document takes precedent.

In 2012, IHS collaborated with partners from USDA Rural Development, EPA, HUD, the Tribal Infrastructure Task Force, and the Small Communities Water Infrastructure Exchange to develop a common format to provide the design basis for sanitation projects funded by any of those entities. The interagency engineering report was intended to streamline the federal funding application process for rural sanitation projects by creating an engineering report template that is acceptable to each of the collaborating agencies. IHS has agreed to accept the common format. The common format was also intended to replace the USDA Bulletins 1780-2 through 1780-4 that have been required by USDA-RD for their funding since 2003.

Although some of the sections of the interagency engineering report may not apply to IHS projects, the content does not vary greatly from that of the Version 11-11-11b Engineering Project Report (EPR). In this Version 2-1-13 of the PMPro Guideline, the EPR format has been adapted to match the requirements of the interagency engineering report. Those sections of the interagency engineering report that likely do not pertain to IHS-funded projects are noted. IHS will continue to use the term "Engineering Project Report (EPR)" for the document that defines the design basis for a project.

An important addition to the EPR is the life cycle cost analysis. A document entitled "Evaluating Life Cycle Costs for 86-121 Projects" which describes the recommended methodology to calculate life cycle costs has been added to the STARS library. As of the

publication of this Version 2-1-13 PMPro Guideline, Vision Element Team #7-2B is working to further define the role of design life in SFC projects. Future versions of the PMPro Guideline will include additional explanation about the importance of design life to the SFC Program. The same team is also working on strategies to evaluate how well proposed sanitation facilities are matched to the operational capacity of the tribal organizations that will operate and maintain those facilities upon completion. Future versions of the PMPro Guideline will include additional content to address these strategies, likely as enhanced risk assessment.

This Version 2-1-13 of the PMPro Guideline incorporates the following changes:

- Adaptation of the Engineering Project Report requirements and template to the format of the draft Interagency (USDA, EPA, HUD, IHS) Preliminary Engineering Report.
- Inclusion of life cycle cost analysis in the Engineering Project Report requirements and template.
- Inclusion of review sheets for the Project Development Plan (PDP), Engineering Project Report (EPR), and Community System Master Plan (CSMP) as Appendices 9, 12, and 14 respectively.
- Inclusion of the Draft Interagency Preliminary Engineering Report guidance as Appendix 13.

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APPENDICES

GLOSSARY OF TERMS AND ACRONYMS

APLC - Affidavit of Punchlist Completion

CPLC - Certification of Punchlist Completion

CO - Contracting Officer. Federal contracting officer when FAR contracts are used or designated tribal official when tribal procurement contracts are used.

COR - Contracting Officer's Representative

CSMP - Community System Master Plan

DE - IHS District Engineer

EPR - Engineering Project Report

HITS - Housing Inventory Tracking System

HPS - Housing Priority System

IA - Interagency Agreement

IHS - Indian Health Service

Method of work - The business mechanism used to construct a sanitation project. For SFC projects the methods are federal procurement, tribal procurement (also referred to as MOA procurement), force account, 638 contract, Title 1 self governance agreement, or Title 5 compact.

MOA - Memorandum of Agreement

NEPA - National Environmental Policy Act

NPV – Net Present Value

O&M - Operations and maintenance

OMB – Office of Management and Budget

PDP - Project Develop Plan

PMBOK - Project management body of knowledge

PMO - Project management office. In the SFC PMPro, this is a virtual center of project excellence that archives best practices and the document tools required to maintain the program.

PMPro - Project Management Program

Progress Schedule - The progress schedule should identify and/or reflect the salient feature of the work, including acquisition materials and equipment, and assign a percentage to each work element. The schedule should cover all major elements of the project and under contracted construction may reflect the bid items of the contract. The schedule provides a basis by which the project manager, contracting officer, contractor/builder, and tribe can evaluate the builder's actual performance when compared with the accepted work schedule.

PS - Project Summary

QA/QC - Quality assurance and control

Report - Preliminary Engineering Report

Schedule of Submittals - In federal or tribal procurement construction contracts there should be a schedule of submittals which provide a timeframe of when the contractor proposes to provide the required submittals to the project manager/engineer. The schedule should provide a workable arrangement for reviewing and processing and incorporate adequate time for the material and product suppliers.

Schedule of Values - The schedule of values should include quantities and prices of items which when added together equal the contract price and subdivides the work into component parts in sufficient detail to serve as the basis for progress payments.

SDS - Sanitation Deficiency System

SFC - Sanitation Facilities Construction

SPPW - Single Payment Present Worth

STARS - Sanitation Tracking and Reporting System

TERO - Tribal Employment Rights Office

USPW – Uniform Series Present Worth

WBS - Work breakdown structure, a results-oriented tree that captures all the work of a project in an organized way. It can be shown graphically or it can be a list of "element" categories and tasks similar to those that would appear on a Gantt chart schedule. A project phase could be considered a work package or a branch of the WBS tree.

1.0 THE SFC PROJECT MANAGEMENT PROGRAM (PMPro)

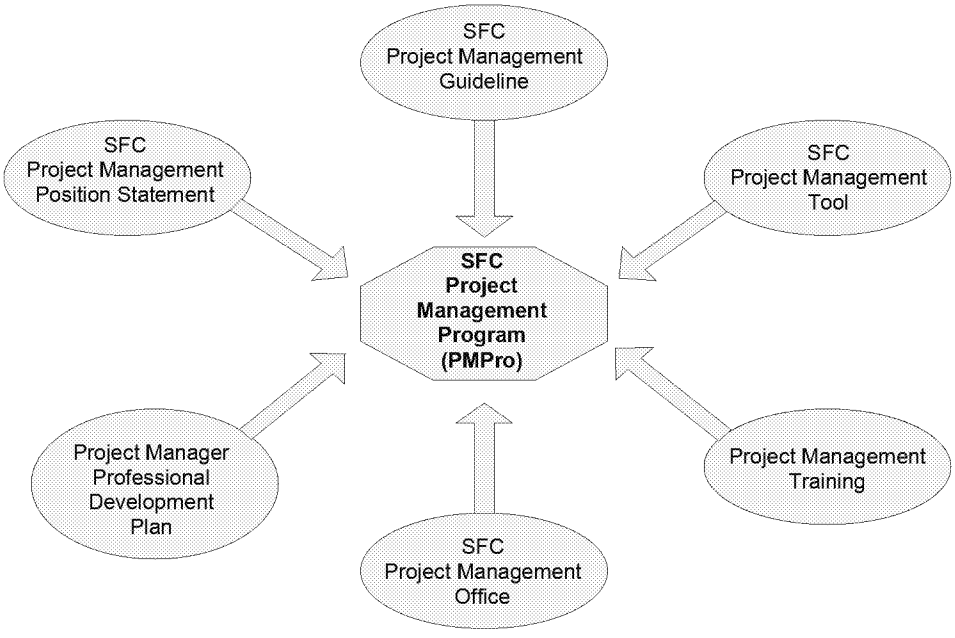
1.1 Introduction

The Sanitation Facilities Construction Program (SFC) Project Management Program (PMPro) is a multi-component approach to making formal project management part of the SFC organizational fabric. It consists of six major components. Each of these is explained in more detail in Appendix 1.

- Project Management Position Statement
- Project Management Guidelines
- Project Management Tool
- Project Management Training
- Project Management Office
- Project Manager Professional Development Plan

The goal of PMPro is simple - to make formal project management part of the SFC culture. The PMPro is designed to achieve this vision by facilitating implementation of project management best practices and supporting individual project manager development.

Figure 1.1 The SFC Project Management Program (PMPro)



1.2 The SFC Project Management Position Statement

Completing and delivering sanitation facilities construction projects is the primary activity the SFC program relies on to accomplish its mission. Project management success is directly linked to SFC program success. To underscore the importance of project management, the SFC program has adopted the following position statement.

Proactive project management is fundamental to our culture and accomplishing the IHS mission. Project management has always been inherent in our service delivery. Formally implementing a Project Management Program is essential to continued success. We embrace "best practices" for project management that will improve our service to our customers. Through this commitment, the SFC program will be known as an exemplary project management organization.

This position statement will serve as the guidepost for the SFC Project Management Program and its various elements.

1.3 The SFC Project Management Guideline

The guideline is one aspect of a comprehensive SFC Project Management Program (PMPro). The guideline describes the roles of project management and project managers in SFC. It also defines SFC project phases and includes recommendations on how to apply project management knowledge to achieve effective management of SFC projects.

Further detail on each of these Project Management Institute knowledge areas is presented in Appendix 2. In addition, these concepts are critically integrated into the various SFC project phases that are presented in subsequent chapters. A thorough elaboration of the project management body of knowledge (PMBOK) concepts is beyond the scope of the guideline; SFC project managers who wish to immerse themselves in these concepts (and seek the Project Management Professional certification) are highly encouraged to seek out the wide range of external courses available on these topics.

This document provides project management guidance for project managers in the Indian Health Service (IHS) Sanitation Facilities Construction (SFC) program. Chapter 3 focuses on the project development phase and Chapter 4 focuses on the planning and design phase, both of which are essential to SFC projects. Together these are the most complex and time consuming activities encountered on a sanitation facilities construction project. Subsequent chapters include project management guidance on construction and closeout activities.

The guideline is intended to be a "what to do," rather than a "how to do" document. Varying circumstances, Area by Area, office by office, and tribe by tribe make every project unique. The guideline is a general framework of best project management practices that leads to the most effective use of SFC project resources. **Ultimately it is up to each IHS Area and individual project manager to determine the best overall approach to managing a given project**. In almost all cases, individual project managers have the best perspective of their project environments and are best suited to determine the most appropriate approach.

1.4 The SFC Project Management Tool

The SFC Project Management Tool (PM Tool) is an electronic means to systematically manage, monitor and report on individual projects and groups of projects or "portfolios". SFC project managers are currently using a wide range of methods for project and portfolio management, ranging from simple "back of the napkin" approaches to Microsoft® Excel spreadsheets and

Microsoft® Project templates. MS Project is the most commonly used tool and will be integrated to work with STARS as the SFC project management tool. The STARS data system has project management capability and is adequate for managing most SFC projects, but MS Project offers high end capability and can be used when needed or desired by project managers.

1.5 The SFC Project Management Training

A key component of the SFC PMPro will be training on the various elements of the program, including the guidelines, the PM Tool, SFC best practices, etc. This training will be conducted internally on both an informal and formal basis. The training component of the PMPro is currently not defined.

1.6 The SFC Project Management Office

The SFC Project Management Office (PMO) is ultimately envisioned to be a virtual Center for Project Excellence that consists of a core group of SFC subject matter experts in the discipline of project management. The project management office component of the PMPro is currently not defined.

1.7 The SFC Project Management Professional Development Plan

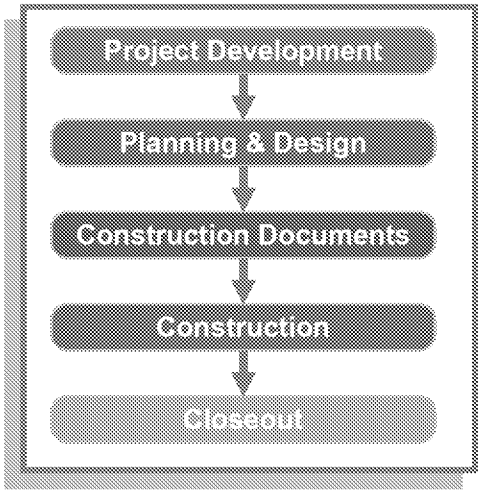
Career development in project management requires a mix of formal training, education, on the job experience, and practice. Continuous project management skill development will be important to the SFC project manager. As a project management organization, it is incumbent on the SFC Directors to encourage and reward skill development and advancement in the project management field. The project manager development plan of the PMPro is currently not defined.

2.0 THE SFC PROJECT PHASES

2.1 Introduction

SFC projects begin with the identification of a water, sewer or solid waste need or deficiency. Once the problem is understood, a potential project is developed that resolves the sanitation deficiency. Identifying projects should occur throughout the year. It often takes a significant amount of time to fully understand and document a deficiency. Project managers must be proactive and engaged with the tribes and communities they serve to identify sanitation facility needs and develop projects to address the deficiencies. Project managers should:

- Understand how the community water, wastewater, and solid waste systems work.
- Know the components of the water, wastewater, and solid waste systems and what deficiencies exist.
- Recognize the tribal stakeholders in the community and who to talk to about sanitation facilities; there is often more than one tribal division or office for each type of sanitation facility.
- Collaborate with the water, wastewater, and solid waste operators to stay informed on operation and maintenance issues and become well-versed on deficiencies they are experiencing.
- Participate in community infrastructure sanitary surveys.
- Be aware of sanitation deficiencies for individual homes.
- Collaborate with the SFC Operation & Maintenance Program.
- Understand the IHS sanitation deficiency system (SDS) and funding systems for Regular and Housing Support.



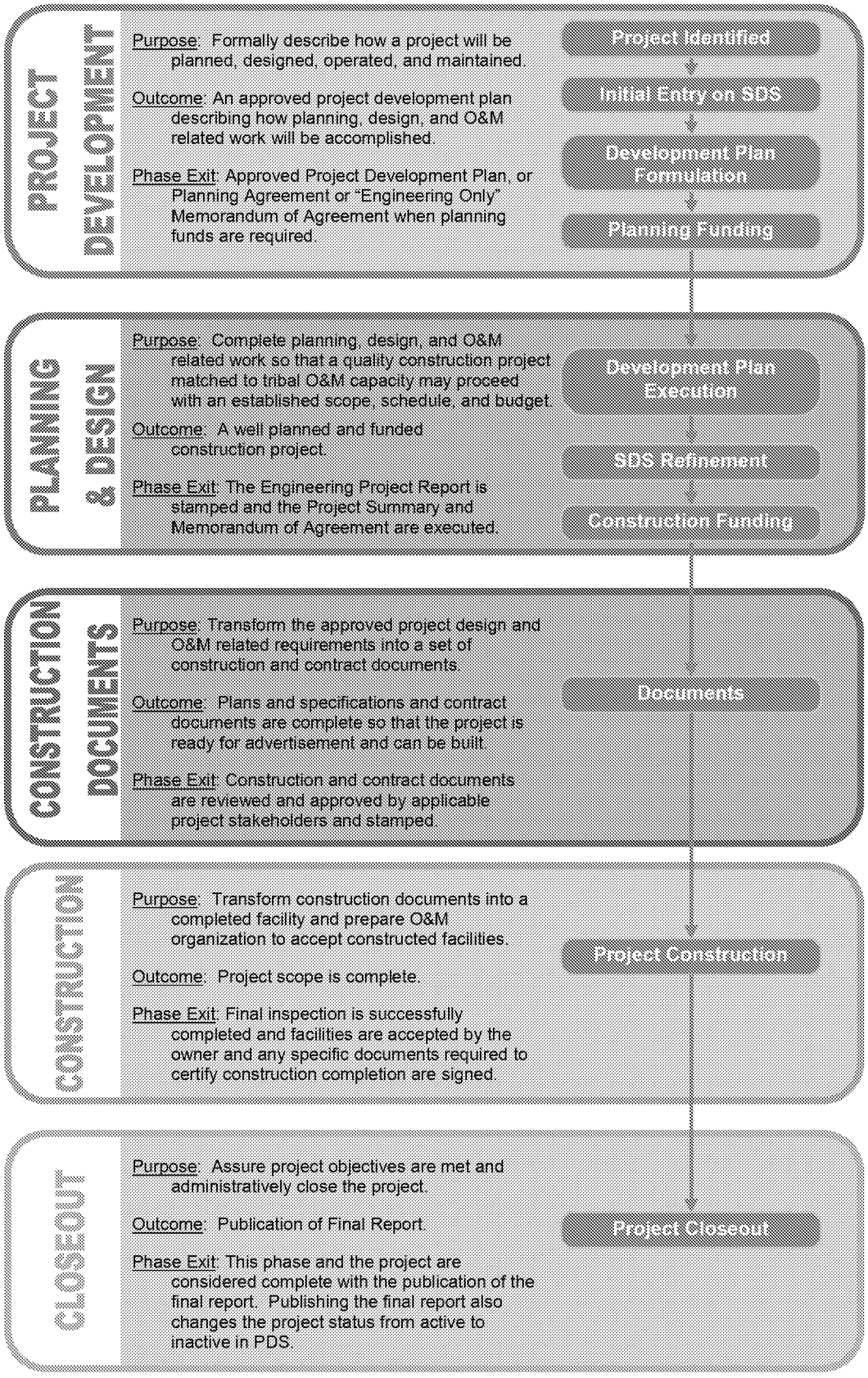
Once identified, a complete SFC project includes the five project phases shown in here. These phases form the structure of an SFC project and should be followed for all projects, regardless of size or scope.

Formally describing project development as a separate phase represents a significant change from the project management structure historically used in the SFC program.

The five-phase project structure is intended to help SFC project managers identify all the steps and tasks necessary for the project to be successfully designed, constructed, and ultimately operated and maintained by the tribal utility. Using this structure will help avoid the common problems associated with insufficient project planning, including:

- Insufficient or inflated initial project budgets.
- Project delays due to unanticipated information requirements (e.g., endangered species clearances, 404 permits, archeological requirements, environmental requirements, surveying, and right-of-way clearances).
- Unanticipated changes in project scope.

Figure 2.1 – The Five SFC Project Phases

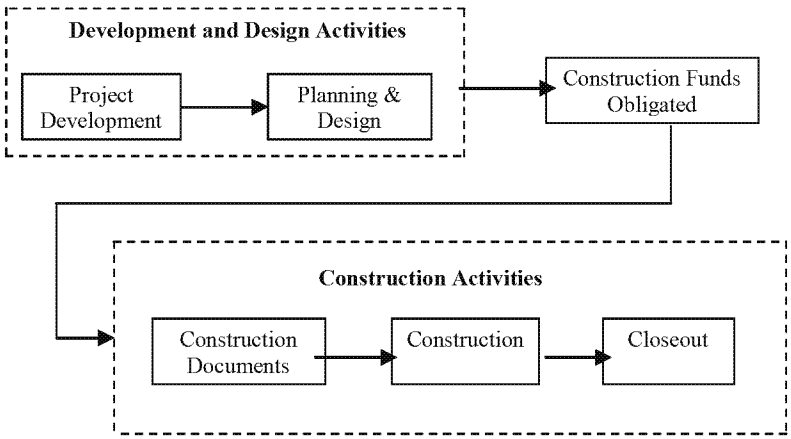


- Cost and schedule overruns.
- Dissatisfied tribal customers and project stakeholders.
- Tribal utilities ill prepared to finance, operate, and maintain facilities.

The SFC project phases are defined and introduced in this chapter. Subsequent chapters in this guidance document are devoted to each of the five project phases and include detailed information about each phase. Figure 2.1 provides a summary overview including the purpose of each phase and the outcome expected prior to continuing to the next phase.

These project phases generally involve two distinct types of activities: the development and design activities and the construction activities seen in Figure 2.2 below. Successfully completing the development and design activities creates a solid platform for the construction activities. Failure to adequately complete the development and design activities can lead to poorly scoped, improperly funded, inefficient construction activities, and frustrated stakeholders. All of these have historically been identified as problematic for some SFC projects.

Figure 2.2 Two Distinct Types of Activities



2.2 Project Development Phase

The project development phase begins once a potential project has been identified.

This is the first formal phase of an SFC project. In this phase, a significant amount of "front end" time is spent identifying information that will be used in the next phase to fully scope, design, and estimate the project. A plan to capture this information is developed in this phase. This Project Development Plan (PDP) is a document created by the project manager in consultation with the stakeholders. It describes how the project planning and design will be accomplished, what operation and maintenance activities will be required, what tasks will be required, what human, technical and financial resources are needed and it defines what type of engineering document will be completed in the next phase.

The project manager identifies whether or not there is a need for planning funds and this is documented in the PDP. Planning funds may not be needed for planning activities. When needed, the PDP will indicate the amount of funding required to complete critical planning activities like water analysis, archaeological surveys, utility rate studies, environmental reports or topographic surveys.

In those cases, a Planning Agreement must be executed between the IHS and tribe to obligate funds to carry out those activities.

The project development phase is complete when the Project Development Plan is approved, or when a Planning Agreement or "Engineering Only" Memorandum of Agreement is approved for those projects that require planning funds.

2.3 Planning and Design Phase

The planning and design phase begins once work to develop the Engineering Project Report (EPR) is initiated.

This is the phase where the design details of the project are developed, in other words the "imagination" phase of the project. The work described in the approved PDP is executed during this phase. If the planning and design activities conducted in this phase require funding, a Planning Agreement or "Engineering Only" Memorandum of Agreement was completed at the end of the previous phase. The result of this phase is a well-defined project scope, detailed design, list of O&M considerations such as operator training, and accurate cost estimate documented in an Engineering Project Report or Community System Master Plan.

Studies to determine project unknowns like environmental, geotechnical conditions or the ability of a tribal utility to finance, operate and maintain facilities, topographic surveys, in-depth field reconnaissance, attainment of rights-of-way may be completed. Activities needed to reduce project risks, site visits, field investigations, establishing alignment and layout, engineering calculations, utility capability evaluations, and process and product selections are all completed during this phase. During this phase, the project unknowns should be eliminated resulting in an acceptable level of project risk and a well-defined project with supporting documentation. The method of work (government contract, tribal procurement, 638 contract, or force account) is identified during this phase if it was not previously defined.

Projects that will potentially be funded with IHS Regular funding will be listed or updated in the SDS based on the engineering work and tribal utility organization capacity development documented in the Engineering Project Report or Community System Master Plan.

The planning and design phase is complete once the Engineering Project Report is stamped and the Project Summary and Memorandum of Agreement are executed for a new construction project.

2.4 Construction Documents Phase

The construction documents phase begins once the project planning document (usually an Engineering Project Report), the Project Summary, and the Memorandum of Agreement are completed and approved.

Transforming the project described in the approved EPR into construction documents that are ready for issue and defining the method of work is completed during the construction documents phase. These documents typically include construction drawings, specifications and other legally binding documents. The construction documents may include requirements for facility start up, detailed training of operators, as-built surveying and composite utility drawings, well defined O&M manual requirements, and other items historically associated with the Closeout Phase.

Major project decisions such as these will ideally have been made in the prior phases. For many SFC project managers the work of producing the construction documents was traditionally thought of as project design work. Using that approach, planning and design work was done coincidentally with the development of plans and specifications. Similarly, O&M deliverables such as operator training, as-built and composite utility drawings, and O&M manuals were historically considered to be part of project closeout. In many cases project managers, under pressure to move on to the next project design, neglected to adequately complete the O&M deliverables which in turn created challenges for tribal utilities charged with assuming operation and maintenance of completed facilities. In the project structure described in the PMPro, the design work is already complete and O&M requirements have already been evaluated before the construction documents are produced.

The construction documents phase ends once the construction documents have been approved by the stakeholders and stamped in accordance with Indian Health Manual Chapter 3-24.3.A.

2.5 Construction Phase

The construction phase begins once the SFC construction documents have been approved by the stakeholders and stamped in accordance with Indian Health Manual Chapter 3-24.3.A.

The sanitation facilities described in the construction drawings, plans, and specifications are built in this phase. If the method of work requires a bidding process, bidding and contractor selection is completed during the construction phase. Construction inspection, quality control, payment of work, and acceptance of work are all activities that are completed in the phase. O&M deliverables such as operator training may also be provided during this phase, either as part of the construction contract or through other funding or resources identified in Engineering Project Report.

The construction phase is complete when the facilities constructed are in operational condition, O&M deliverables such as operator training, as-built and composite utility drawings, and O&M manuals required by the construction documents have been furnished, and the owner has

accepted the facilities. Each Area may have specific documents required to certify construction completion.

2.6 Closeout Phase

This phase begins once the owner has accepted the facilities.

Historically, any work associated with operator training, O&M manuals and documentation, as-built and composite utility drawings, ordinance and fee structure development, and project warranty were considered project closeout activities. These activities may still be part of this phase for some projects. Under PMPro, project managers are expected to evaluate and address O&M considerations and costs throughout the five phases of project management to ensure that risks associated with the long term tribal operation, maintenance, and sustainability of completed facilities have been mitigated.

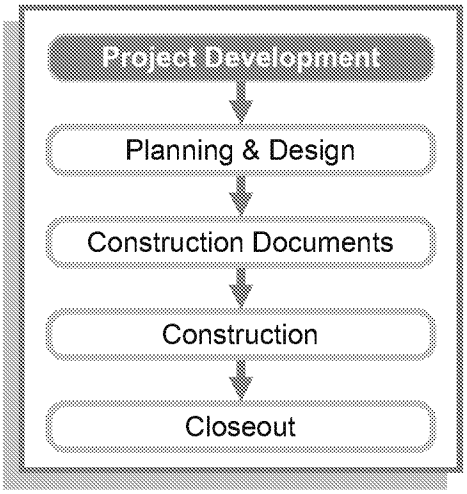
For many projects O&M related activities will have been initiated prior to or concurrent with construction to ensure that tribal utility departments are adequately prepared to finance, operate, and maintain completed facilities. An example of this would be operator training for operation of an advanced Sequencing Batch Reactor (wastewater) or arsenic removal (water) plant. To begin training after the construction is complete would be far too late to ensure a reasonable chance of successful and sustained operations of the new facilities.

The closeout project and the project are considered complete when a written notice of project completion/transfer agreement has been signed and the Final Report is published. Publishing the Final Report also changes the project status from active to inactive in PDS.

3.0 THE PROJECT DEVELOPMENT PHASE

3.1 Introduction

The project development phase begins once a potential project has been identified. The phase ends when the Project Development Plan is approved, or when a Planning Agreement or "Engineering Only" Memorandum of Agreement is approved for those projects that require planning funds. Depending on the feasibility of a conceptual project, potential source of construction funds, priority ranking of the project on SDS, and availability of funds regardless of source, a project may remain in the project development phase for a long time.



Project development is the process of identifying and scheduling activities that will be completed during the planning and design phase. Many project managers underestimate the importance of sound, informed project development. There is a strong tendency to "start the project" and focus on the construction documents and construction phases that are explicitly related to project deliverables. Some SFC project managers rush into the construction documents or construction phase of a project and then find it necessary to change scope, find additional funding due to cost over-runs, discover the short and long term viability of the facilities to be compromised, or to have the construction delayed by what appears to be unanticipated requirements. Common examples are difficulty obtaining right-of-way or NEPA clearance, insufficient revenue stream to support the completed facilities, limited operator training, incomplete record drawings and O&M manuals for existing utilities, and unexpected geotechnical conditions. In reality, the requirements to mitigate these risks were always present but were not identified by the project manager due to the lack of rigorous project development.

To help the SFC project manager identify and plan for as many project requirements as possible, the project development phase is the first formal phase of all sanitation facilities construction projects. All projects begin with a concept or idea to correct an identified sanitation deficiency or infrastructure need. This conceptual stage is part of the project development phase. Consistent with the SFC program criteria, the projects are listed on the SDS or incorporated into the annual funding request in HPS. Many potential projects remain in the project development phase without further development and are not planned and designed.

Although typically the project engineer serves as the project manager for the project, key members during the project development phase, which would be considered as the project management/delivery team, could be as listed below. Each would have specific roles and duties and varying resource responsibilities depending on the complexity of the proposed undertaking.

- Project Engineer
- Utility (O&M) Consultant
- District Engineer
- Engineering Technician(s)

- Director/Deputy Director
- Technical Writer
- Office Automation Clerk

Additionally, as part of the project development process, the following contacts should be initiated:

- Tribal
- Funding Agency
- Regulatory/Permitting Agency

Early in the development phase the project management/delivery team determines if a potential project is likely to be funded by IHS through SDS or with housing funds or with outside agency funding. If it appears that a proposed project will be funded in the relatively near future, it is further developed. The primary deliverable of the project development phase is a Project Development Plan (PDP). In it, the project manager outlines in detail how the project will be planned and designed. The PDP typically identifies the informational requirements to complete the project design, risks associated with developing the project, and human and financial resources required for planning and designing the project and preparing the tribe to operate the finished facilities. It also describes how the project manager will collect information necessary to develop a project with a defined project scope and accurate budget. The level of detail required for the PDP will depend on the complexity of the planning and design work needed to carry out the project. It will be up to the project manager to determine the appropriate level of detail.

3.2 Identifying Potential Projects

The project development phase begins when a sanitation deficiency or need is identified. To identify new projects, project managers must be proactive and engaged with the tribes and communities they serve in the following ways:

- Understand how the community water, wastewater, and solid waste systems work.
- Know the components of the water, wastewater, and solid waste systems and what deficiencies exist.
- Recognize the tribal stakeholders in the community and who to talk to about sanitation facilities; there may be more than one tribal division or office for each type of sanitation facility.
- Collaborate regularly with the water, wastewater, and solid waste operators to stay informed about operation and maintenance issues and become well-versed about deficiencies they are aware of or that they are experiencing.
- Participate in community infrastructure sanitary surveys.
- Be aware of sanitation deficiencies for individual homes.
- Be aware of regulatory and IHS standards for adequate facilities.
- Collaborate with the SFC Operation & Maintenance support providers.
- Understand the IHS sanitation deficiency system (SDS) and funding systems for Regular and Housing Support.
- Understand outside agency funding requirements and timelines.

- Understand applicable regulatory requirements related to the deficiency or need (i.e., EPA surface water treatment rules).

By being knowledgeable about those topics, project managers will be well equipped to identify sanitation facility needs and develop projects to address the deficiencies. Identifying potential projects should occur throughout the year. It often takes a significant amount of time to fully understand and document a deficiency. One approach to help document deficiencies and understand how the systems work is for the project manager to actively participate in the Sanitary Survey process. There are several other ways to become familiar with the sanitation facilities and their deficiencies within tribal communities. Tribal departments, staff, or councils may propose potential projects. During the course of day-to-day work in the communities project managers may become aware of projects. The current SDS Guideline includes a discussion on identifying sanitation deficiencies. Best practices may vary locally.

Figure 3.1 is a schematic that shows an overview of the project development phase. A detailed explanation of this phase is provided in this chapter.

3.3 Initial Entry on SDS or HPS

The IHS Sanitation Deficiency System (SDS) is an inventory of the sanitation deficiencies of American Indian and Alaska Native homes and communities. Those sanitation deficiencies include needed water, sewer, and solid waste facilities for existing American Indian and Alaska Native homes. The sanitation deficiencies are identified and entered into the SDS by each of the 12 IHS Area Offices in consultation with the respective tribes in those Areas. The sanitation deficiency inventory is continually updated and annually reported to Congress as required by the Indian Health Care Improvement Act, Public Law 94-437, as amended (25 U.S.C. 1601 et seq). The IHS Housing Priority System (HPS) is an inventory of need to serve eligible new or like new homes with housing funds.

Once a deficiency is identified, the project manager enters a conceptual project on SDS that will remedy the deficiency regardless of how the potential project is identified. An "engineering only" project may be entered when the remedy for an identified deficiency is not readily apparent or a project is very complex. This initial entry on SDS has the primary purpose of documenting and reporting the need. The initial listing typically includes a general description of what needs to be done at a conceptual level. The current version of the Guide for Reporting Sanitation Deficiencies for Indian Homes and Communities (SDS Guidelines) describes the requirements for the initial SDS entry. Projects initially entered in SDS must include a cost estimate that captures the conceptual costs for planning, construction, O&M support, and project closeout related items.

In accordance with the SDS Guidelines, this estimate must "be accurate to within plus or minus 25 percent". Individual Areas may have guidance for SDS estimating and format. At minimum the conceptual project estimate must contain costs associated with project planning and design, construction, and post construction. Costs for contingencies, professional fees, IHS project technical support, TERO, and tribal taxes, procurement and administrative support must also be included.

A template for estimating the cost of a conceptual project is included in Appendix 3, and an example is included in Appendix 4.

When the project is initially listed, it usually has not had the benefit of planning and design activities to incorporate stakeholder input, clarify project scope, identify and mitigate risks, and more accurately estimate the cost. At this stage, a determination is made on the likelihood of the project being funded. If a project is in or near the SDS funding range or is likely to be funded by other sources such as IHS housing or contributed funds, the project is further developed. If a project is not likely to be funded because of a low SDS score or for some other reason, additional project development may not be necessary. However, these projects should be reviewed annually to determine if their priority has changed.

Each Area establishes local criteria consistent with national guidelines and policies in order to determine which projects are further developed. Since a project must have a completed Engineering Project Report in order to be eligible for construction funds, the criteria are established to assure a continual flow of projects ready to receive construction funds. One example criteria for SDS projects would be to target for further development projects on the SDS inventory that are likely to be funded within the next 3-years. Under this approach, if an Area historically receives $2.0M of regular funds, projects within the top $6.0M should be further developed by completing the project development phase. The intent of this requirement is to schedule planning and design activities in advance such that there is always a group of well planned projects eligible for construction funding. Projects below this threshold will remain on the SDS inventory as conceptual projects and are reviewed annually. Concentrating on projects atop the SDS list does not preclude other projects from project development. Areas should consider prioritizing other projects for development based on tribal priority, likelihood of outside funding, and other local criteria. Areas should also establish a system for prioritizing project development activities for projects eligible for IHS housing funds.

3.4 Select Planning and Design Phase Deliverable

Project development is the process of identifying and scheduling activities that will be completed during the planning and design phase. In order to identify and schedule the required activities, the project manager must first determine the desired deliverable. Generally one of two basic documents will be delivered in the planning and design phase; the Community System Master Plan or the Engineering Project Report. The PDP will identify which deliverable is needed and how it will be completed for each project selected for further development in the project development phase. It may be appropriate to complete both deliverables depending on project complexity and specific needs and risks. Some elements are common to both deliverables, but overall they have a distinct purpose.

The two documents are introduced in Sections 3.4.1 and 3.4.2. These are described in more detail in Chapter 4.

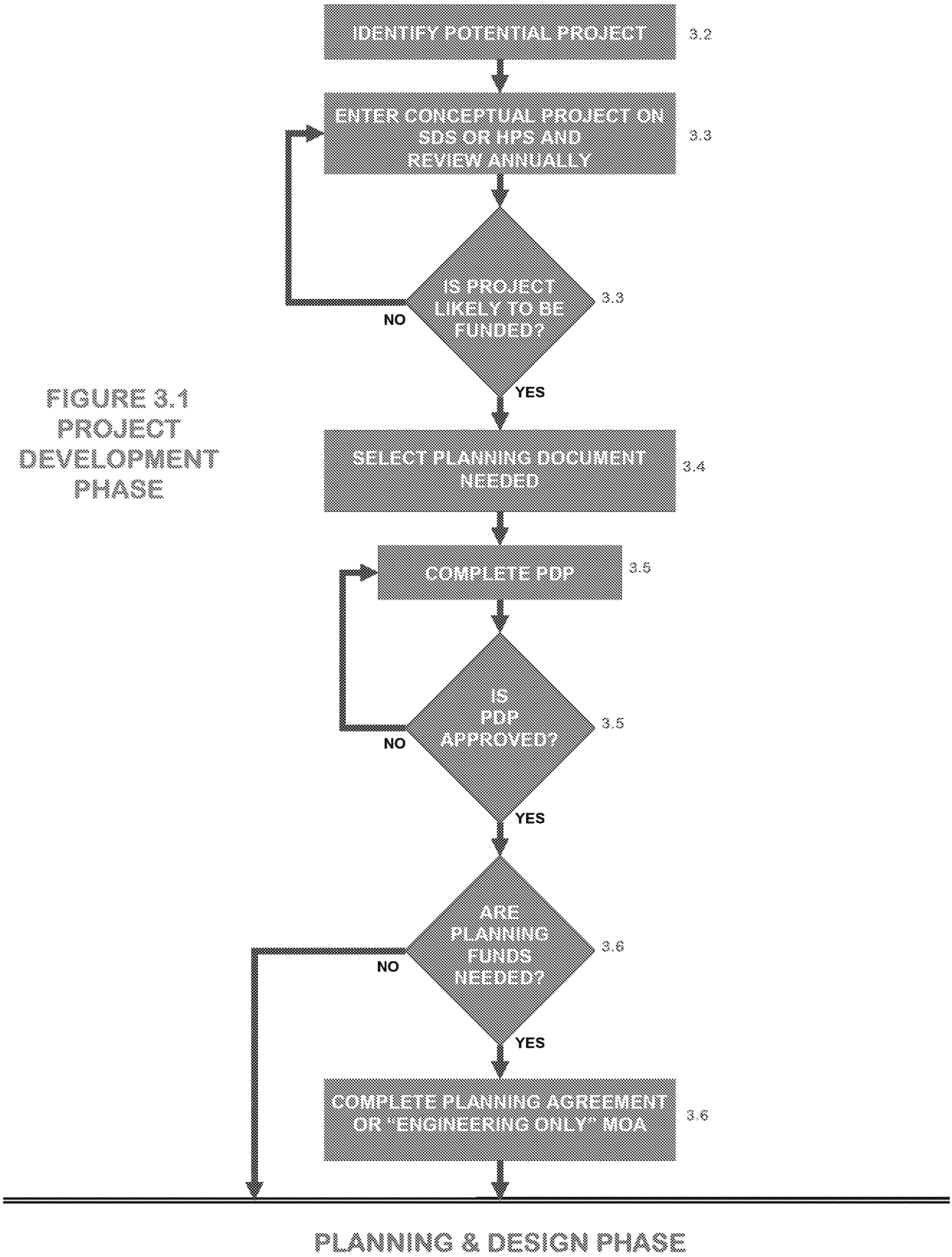


FIGURE 3.1
PROJECT
DEVELOPMENT
PHASE

3.4.1 The Engineering Project Report

An Engineering Project Report describes a construction project in sufficient detail so that an engineer unfamiliar with the project could refer to it and find enough detail to complete contract plans and specification with only minor changes to the described project scope and budget. The Engineering Project Report is a professional work product and the professional engineer responsible for overseeing its preparation must stamp the completed report. The terms feasibility study, preliminary engineering report, or preliminary design report and others have been used historically to describe similar efforts. Refer to Section 4.2.1 for more details on the Engineering Project Report.

The Engineering Project Report must be completed and approved before a project will be eligible for construction funding. Consequently, the Engineering Project Report is the planning and design phase deliverable normally identified in the PDP. This is also the main reason why Project Development Plans are required for the top tier of the SDS project inventory. This provides a pool of projects with completed Engineering Project Reports that are eligible for construction funding.

3.4.2 The Community System Master Plan

The second potential planning and design phase deliverable is the Community System Master Plan. This document is an overall roadmap for infrastructure development. It can be specific to a community or reservation water system, sewer system, solid waste system, or some combination of these. It is the highest-level SFC planning activity, and holistically looks at the sanitation needs of an entire community or reservation. This contrasts with an Engineering Project Report in which the focus narrows to a specific system deficiency or the needs of a single proposed housing development. Completing a Community System Master Plan is a significant undertaking and may be accomplished under an engineering-only project. Refer to Section 4.2.2 for more details on the Community Master Plan.

3.5 The Project Development Plan

Once the planning and design phase deliverable has been selected, the project manager completes the Project Development Plan (PDP). The PDP is a road map for the activities that will be completed in the project planning and design phase. It clearly states the desired deliverable(s), what planning and design work will be done, who will do it, and when they will do it. If the planning and design activities will require funding, the PDP will also identify how much it will cost. The PDP is the primary deliverable from the project development phase.

Project managers should always consider completing a work breakdown structure (WBS) prior to drafting the PDP. A WBS is a visual planning tool used to identify and sequence tasks, assign resources, and estimate task durations. Once completed, it is easily translated into a written project scope of work, schedule, and budget. Investing time in a WBS is most beneficial for complex projects or for inexperienced SFC project managers who are unfamiliar with program planning and design activities. The WBS is described further in Appendix 2.

The amount of detail included in the PDP will depend on the level of complexity of the project. A template for a PDP and a complete example are provided in Appendices 5 and 6 respectively. A digital copy of the template can be found in the STARS library. In general, the Project Development Plan includes the following information.

- Problem Statement – Description of the problem with applicable background.
- Scope of Work – Description of the type of planning document needed and activities that will be carried out during the planning and design phase, both by IHS staff and outside contractors (when needed).
- Schedule – A Gantt chart, milestone schedule, or other similar schedule that shows when the proposed tasks in scope of work will be completed and who will complete them.
- Cost Estimate – An estimate of the costs required to complete the planning and design work.
- Communications Plan – List of key project stakeholders and how the project manager will communicate with them during the planning and design phase.
- Procurement Plan – When needed, a discussion of how the services of outside contractors will be procured.
- Quality Assurance Plan – A description of how the scope of work will be carried out to assure the final product is of high quality.
- Risk – A description of how risks they will be analyzed and addressed during the planning and design phase.
- Human Resources – A discussion of who will complete the Engineering Project Report and/or Community System Master Plan and the SFC internal capabilities to carry out the work. This should include a discussion of overall office project workload and current professional capabilities with respect to the proposed work. The need to augment office resources with new staff or staff from other offices would be illustrated here.

The Project Development Plan should be approved minimally at the District Engineer level, although determination for the final review and approval levels is left to individual Areas. Additionally, the PDP should be an attachment to the SDS project and could be reviewed by Area and HQ during the SDS review process. In cases where planning and design funds are not needed, project development phase ends with an approved Project Development Plan. However, for projects that require planning and design funds, a Planning Agreement or Memorandum of Agreement is required to obligate the funds as described in Section 3.6.

To assist in the review for completion, a review sheet for a PDP is included in Appendix 9.

3.6 Planning and Design Funding

It is incumbent on project managers to identify the costs required to properly plan and design projects, and to evaluate and increase the tribal capacity to operate and maintain the facilities over the long term (i.e. to ensure sustainability). These costs are identified in the PDP as described above. A Planning Agreement or Memorandum of Agreement is required to obligate the planning funds for the activities described in the PDP. An approved PDP is the basis for this Planning Agreement or MOA. Signature authority for the Planning Agreement and the

Memorandum of Agreement are the same. Both are arrangements between the tribe and the Indian Health Service and serve as obligating documents. All funding of functions, services, and activities must comply with the current version of the Criteria for the Sanitation Facilities Construction Program.

There are two general approaches to funding planning and design activities. In both cases the activities are specified in the PDP and will be paid with project funds. IHS Regular or Housing funds or contributed construction funds can be used depending on the type of the project.

One general approach described below (Method 1) is for activities of relatively minor cost funded with a Planning Agreement. In most cases planning, design, and pre-construction activities for SFC projects will be completed with this mechanism. Sources for funds in support of this method are detailed in 3.6.1 below. Funds expended for planning and design phase activities will ultimately be reported as part of the total project cost. Planning and design funding is not additional to the project cost, but rather part of the total project cost.

The other less common approach (Method 2) is for major design activities where an engineering only project is established. Funding for this engineering only project is obligated with a Memorandum of Agreement. In such cases the engineering only project is typically the first phase of a multi-phase project. Sources for funds in support of this method are detailed in 3.6.2 below.

The features of each method are summarized below.

	Obligating Document	IHS Regular Funds	IHS Housing Funds	PDS	Typical Use
Method 1	Planning Agreement	Fund in priority order. May mix with contributed funds but not housing funds.	May mix with contributed funds, but not regular funds.	PDS # is shared with subsequent construction project. Planning and design costs are reported with construction costs.	Small and/or routine planning and design projects of short duration.
Method 2	MOA	Fund in priority order. May mix with contributed funds but not housing funds.	May mix with contributed funds, but not regular funds.	Stand alone "engineering only" project with unique PDS number.	Large and/or complex planning and design projects of long duration.

Because planning and design phase funding is the initial part of the project construction funding, Regular funds can only be used for planning activities for Regular projects and Housing funds can only be used for planning activities for Housing projects. Contributed construction funds can be used for planning activities for Regular or Housing projects provided the contributing entity agrees.

3.6.1 Planning & Design Funding Method 1 - Planning Agreement

Method 1 is the preferred and most commonly used approach for planning and design activities for SFC projects. In this approach the planning and design phase is the second phase of a complete SFC project. All phases of the project comprise one SFC project with one PDS project number. Method 1 can be used to plan construction projects that will be funded with IHS Housing or Regular funds, or contributed funds. The obligating document for planning and design phase activities is a Planning Agreement.

Under Method 1 a PDS project based on the Project Development Plan is entered into STARS to archive expenditures made during the planning and design phase. The deliverable for the planning and design phase will be one of the two basic planning documents described in Section 3.4: a Community System Master Plan, and/or an Engineering Project Report. Preconstruction activities such as obtaining rights-of-way, permitting, NEPA activities or other may also occur during the planning and design phase.

Regular Projects

If the SFC project will be funded with IHS Regular funding it is initially listed in the SDS as a complete project that includes costs for planning, design, construction, O&M support, and project closeout related items. As described in Section 3.3, Regular projects in the top tier of the SDS list must have a completed Project Development Plan. Projects will be selected for planning and design in priority order. When selected, planning and design activities will be carried out as outlined in the approved PDP.

Regular funds for planning can be distributed to SDS projects that are in the top tier of SDS projects but below the funding range. The source of these funds can be unobligated prior year funds or, if available, unobligated current year Regular funds that remain after all projects in the funding range are fully funded. Areas could also allocate approximately 10-15% of current year funding for planning activities instead of relying on "remaining" funds. The distribution of Regular funds for planning must also follow the priority sequence starting with the highest SDS priority project requiring planning funds below the funding line. A Planning Agreement will obligate Regular funds for the planning and design phase activities described in the Project Development Plan.

The conceptual project initially entered into SDS remains while planning and design activities are carried out. Later, the scope and cost estimate of the original SDS project will be revised as appropriate during the planning and design phase as described in Section 4.3. The revised total cost will include the amount obligated with the Planning Agreement in addition to the costs identified in the subsequent planning and design phase to complete the construction and provide the O&M and closeout related activities. In priority order, the revised SDS project will be funded into the PDS project that was created to conduct the planning and design phase activities.

Occasionally projects may fall into the funding range before adequate planning has been completed. Funding for the planning activities only for this type of conceptual project initially entered into SDS can be distributed without fully funding the project. The SFC Director, after

tribal consultation, should apply the "Other Considerations" points to the original project to force the priority score low enough to fall below funding range until the planning activities are complete. Upon completion of the planning activities, the "Other Considerations" points should be removed and the total project competed on the SDS priority list.

The following example illustrates how planning activities may be funded with Regular funds. The example Area receives $2,200,000 in Regular funds and has the following projects identified on SDS. All of the projects in the funding range have completed Engineering Project Reports except for Project E. The Project Development Plan for Project E indicates a need for $20,000 for planning and design activities.

	SDS Priority	Project amount	Cumulative amount	EPR Completed?	Required planning $	
Project A	1	$394,000	$394,000	Yes	$0	
Project B	2	$457,000	$851,000	Yes	$0	
Project C	3	$190,000	$1,041,000	Yes	$0	
Project D	4	$569,000	$1,610,000	Yes	$0	
Project E	5	$225,000	$1,835,000	No	$20,000	
Project F	6	$345,000	$2,180,000	Yes	$0	Funding
Project G	7	$110,000	$2,290,000	Yes	$0	Threshold
Project H	8	$568,000	$2,858,000	Yes	$0	
Project I	9	$134,000	$2,992,000	No	$50,000	
Project J	10	$70,200	$3,062,200	No	$0	
Project K	11	$5,300	$3,067,500	No	$15,000	
Project L	12	$502,000	$3,569,500	No	$12,000	
	....					

The SFC Director fully funds projects within the funding range that are eligible for construction funds (Projects A through D and Project F). The Director also funds Project E planning and design activities with $20,000 and then adds enough "Other Considerations" points to Project E to push it below the funding range and the SDS priority sequence automatically revises.

	SDS Priority	Project amount	Cumulative amount	EPR Completed	Required planning $?
Project A	1	$394,000	$394,000	Yes	$0
Project B	2	$457,000	$851,000	Yes	$0

	SDS Priority	Project amount	Cumulative amount	EPR Completed	Required planning $?	
Project C	3	$190,000	$1,041,000	Yes	$0	
Project D	4	$569,000	$1,610,000	Yes	$0	
Project F	5	$345,000	$1,955,000	Yes	$0	
Project G	6	$110,000	$2,065,000	Yes	$0	Funding
Project H	7	$568,000	$2,633,000	Yes	$0	Threshold
Project I	8	$134,000	$2,767,000	No	$50,000	
Project J	9	$70,200	$2,837,200	No	$0	
Project K	10	$5,300	$2,842,500	No	$15,000	
Project L	11	$502,000	$3,344,500	No	$12,000	
Project E	12	$225,000	$3,589,500	No	$0	
	....					

After Project E is funded for planning and removed from the funding range, Project G rises into the funding range and is fully funded. The remaining Regular funding then is:

($2,200,000-$2,065,000 - $20,000) = $115,000

This amount is not adequate to fund Project H so the SFC Director can obligate planning funds to Projects I, K, and L in that order since the Project Development Plans for those projects indicate planning funding is needed.

Housing or Contribution Projects

If the SFC project will be funded with IHS Housing funds it may not be listed on SDS. In some cases projects funded by outside agency contributions may not listed on SDS either. Regardless of the source of project funds, it is still desirable to have a completed Project Development Plan to ensure well scoped and estimated projects. The Project Development Plan will identify planning and design activities including those which require funding. A Planning Agreement will obligate Housing or contributed funds as needed for the activities described in the Project Development Plan for this type of project.

Later, the scope and cost estimate of the original project will be revised as appropriate during the planning and design phase as described in Section 4.3. The revised total cost will include the amount obligated with the Planning Agreement in addition to the costs identified in the subsequent planning and design phase to complete the construction project. If the project was initially listed on SDS, the project is revised as appropriate.

3.6.2 Planning & Design Funding Method 2 – Memorandum of Agreement

This approach is used primarily for major planning and design activities that have significant costs. The source of funding for this type of project is consistent with Chapter 5 of the current *Criteria for the Sanitation Facilities Construction Program*. The obligating document is a Memorandum of Agreement.

Under Method 2 the planning and design phase comprises a complete SFC "engineering only" project and has a PDS project number. Any subsequent construction activities will be projects also funded with a Memorandum of Agreement and with a different PDS number. One engineering only project may provide the design basis for multiple subsequent construction projects.

Typically an engineering only project developed for planning and design activities will be the first phase of a multi-phase project. When a project of this nature is funded, the Project Development Plan is the basis of the Project Summary.

The deliverable for an engineering only project will be one of the two basic planning documents described in Section 3.4: a Community System Master Plan and/or an Engineering Project Report. The updated construction project(s) described in the deliverable will be added to or updated on the SDS list at the conclusion of the engineering only project.

3.7 Permits, Easements, Rights-of-Way, and NEPA

At a minimum the engineering project report will have a discussion of applicable permits, easements, rights-of-ways, and background environmental information to support the NEPA determination. In many case activities associated with obtaining these permits and the NEPA determination is completed during the Planning and Design Phase. Any applicable permits and easements not secured in during this phase must be acquired in the construction documents Phase. Permits acquired during earlier project phases that have expired may need to be renewed.

The engineering project report may identify permit, easement or environmental requirements that need to be incorporated into the drawings, specifications or contract package. The permits required will be dictated by the scope of a project and the location of the work, but the following permits may be required. In some cases the responsibility to identify local permit requirements is assigned to the party that completes the construction.

Encroachment Permit - An encroachment permit allows permission to have facilities occupy space in a public right of way and is typically required for any pipe, pipeline, pavement, fence, building, or any structure, which is placed in, under or over any portion of an agency's property, roadway or easement. Responsibility of the contractor or agency to obtain the permit must be assigned in the construction documents prior to construction. The construction documents may identify an existing permit.

Grading Permit - This permit authorizes the excavating, filling, stockpiling, and moving material, compacting soil, creating borrow pits, or combinations of these activities within an agency's jurisdictional boundaries. It is generally the responsibility of the contractor or builder to obtain the permit prior to construction. The construction documents must identify the party responsible for obtaining this permit.

Excavation Permit - A permit that is required for the purpose of excavating for installing utilities in the public right of way where excavation is required. At a minimum, this permit will be required to construct water and sanitary sewer mains and buried electric power, cable and telephone lines. It is generally the responsibility of the contractor/ builder to obtain the permit prior to construction. The construction documents must identify the party responsible for obtaining the permit or identify an existing permit.

Traffic Control Permit - A traffic control permit is required for all public improvement projects, construction projects and other work which encroaches into the public right-of-way including the sidewalk area. Most jurisdictions will require traffic control plans that demonstrate how traffic will be managed during the construction of the project. Responsibility to obtain the permit can be assigned to the contractor or IHS but the permit must be in place prior to construction. The construction documents must identify the party responsible for obtaining the permit or identify an existing permit.

Stormwater Permit - A stormwater permit is required by almost all construction site operators engaged in clearing, grading, and excavating activities that disturb one acre or more. Stormwater discharges from construction sites, including groundwater discharges pumped from excavations, must be permitted under the EPA National Pollutant Discharge Elimination System (NPDES) program. Although either the contractor or IHS can get this permit, responsibility to obtain the permit prior to construction is usually assigned to the contractor. The construction documents must identify the party responsible for obtaining the permit or identify an existing permit.

A Stormwater Pollution Prevention Plan (SWPPP) is required as part of the permit. This plan outlines the elements that will be addressed to prevent the contamination by water runoff leaving the construction site. The SWPPP may have been developed in the engineering project report and discussed in the Environmental Review. The SWPPP elements usually are incorporated into the construction documents.

Section 404 permit - The U.S. Army Corps of Engineers (USACE) regulates the discharge of dredged or fill material under Section 404 of the Clean Water Act. A Section 404 permit is required if the construction work will result in the discharge of dredged material or fill material into waters of the U.S and may be required if fill will be placed during construction. Responsibility to obtain the permit can be assigned to the contractor or IHS but the permit must be in place prior to construction. The need for a Section 404 permit ideally will have been discussed in the engineering project report and noted in the Environmental Review. The construction documents must identify the party responsible for obtaining the permit or identify an existing permit.

Tribal Permits - For some proposed work on tribal lands, tribal permits (or fees) may be required. These may include tribal Employment Rights Office (TERO), construction, or development permits. These may include building or tapping permits. Specific tribal permit and fee requirements ideally will have been discussed in the engineering project report. The construction documents must identify the tribal permits that will be required and the party responsible for obtaining the permits.

System Operational Permits - Post-construction operational permits or fees associated with the water, sewer or solid waste systems are required by some utility operators or public jurisdictions. Typically, permits may be required for wastewater treatment and disposal systems that discharge effluent to waters of the U.S. or subsurface. The construction documents must identify the operational permits that will be required and the party responsible for obtaining the permits.

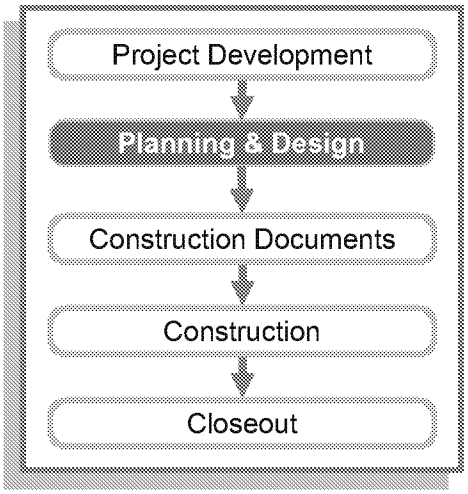
3.8 Concluding the Project Development Phase

For projects that do not require funding for planning and design activities, the project development phase ends when the Project Development Plan is approved.

In cases where planning and design funds are needed, the project development phase culminates with the approval of either a Planning Agreement or "Engineering Only" Memorandum of Agreement. The completion of the project development phase means the required project planning and design needs are identified and supported. The project manager will follow the approved Project Development Plan to ensure that the planning and design phase work is efficiently executed. A well planned and executed planning and design effort will translate into completed facilities that best meet the needs of tribal communities and are likely to be sustainable in the long term.

4.0 THE PLANNING AND DESIGN PHASE

4.1 Introduction



The planning and design phase begins once work to develop the Engineering Project Report (EPR) is initiated. During the planning and design phase the detailed tasks that were identified in the approved PDP are executed. This is the phase where the design details and conditions to ensure long term sustainability of the project are developed. It can be thought of as the "imagination" phase of the project. The planning and design phase ends when the Engineering Project Report is stamped and the Project Summary and Memorandum of Agreement are executed for a new construction project.

Studies to determine project unknowns like environmental or geotechnical conditions, topographic surveys, in-depth field reconnaissance, right-of-way considerations, or the ability of the tribal utility to operate and maintain facilities may be completed. Activities needed to reduce project risks such as site visits, field investigations, determining alignment and layout, engineering calculations, utility capability evaluations, and process and product selections are completed during this phase. In the historical SFC project structure many of these activities were completed as the construction documents were being developed.

Projects that will potentially be funded with IHS Regular funding will be listed or updated in the SDS based on the engineering work completed during this phase. The decision to fund the project is made during this phase. If the project is selected for funding, the Project Summary and Memorandum of Agreement are completed. This phase is complete when the project Memorandum of Agreement for construction is approved.

The primary *tangible* outcome of this phase is an approved comprehensive Community System Master Plan or Engineering Project Report and project documents. As importantly, the primary *intangible* outcome is a project with a detailed design that is well scoped, accurately estimated, and with well understood risks to both construction and long term operation and maintenance; in other words "a project with no surprises."

4.2 Planning and Design

Executing the planning and design activities described in the Project Development Plan (PDP) is the first step in this phase. Typically, completing the activities described in the PDP results in an Engineering Project Report (EPR) or a Community System Master Plan. Examples of these planning and design deliverables from various Areas can be found in the project management section of the STARS library. Areas can adopt their own templates and standards for these documents. It is important to remember that the deliverable is identified in the project development phase but is created in the planning and design phase.

4.2.1 The Engineering Project Report

The Engineering Project Report describes a proposed construction project in sufficient detail that an engineer unfamiliar with the project could prepare construction documents (plans and specifications) with only minor changes to the project's budget and scope. The completed report is stamped by the professional engineer responsible for overseeing its development. An approved Engineering Project Report is required in order for a construction project to be eligible for IHS funding.

Figure 4.1 is a schematic that shows an overview of the planning and design phase. A detailed explanation of this phase is provided in this chapter.

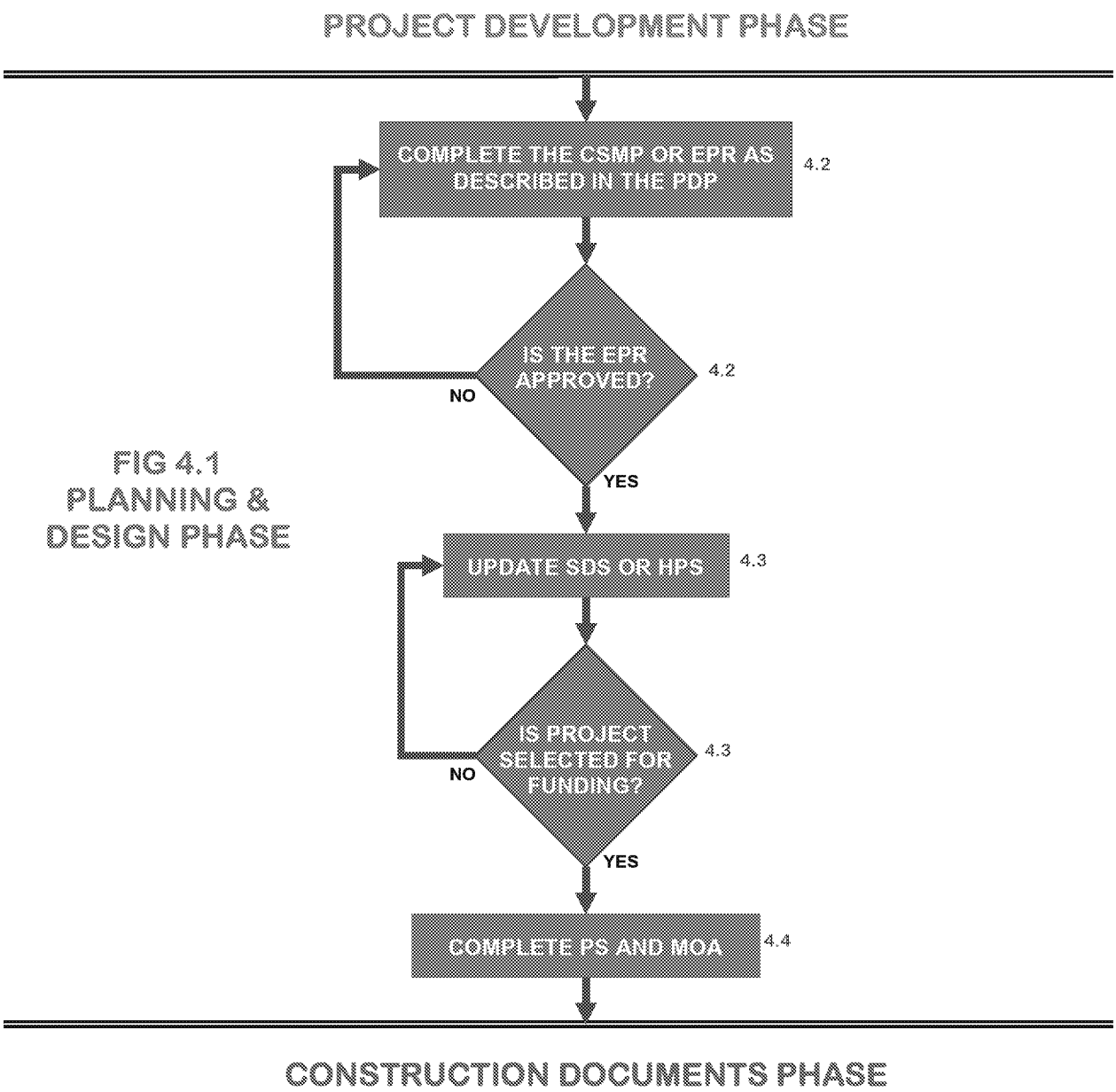


FIG 4.1
PLANNING &
DESIGN PHASE

The process of completing the Engineering Project Report should identify and mitigate risks that could impact the project scope or budget later in the project lifecycle or could impact the long term sustainability of completed facilities. Examples of activities that are typically carried out to support Engineering Project Report preparation include environmental investigations, geotechnical investigations, preliminary alignment and layout, engineering calculations, process and product selections, cost estimating, and O&M organization assessment. The outcomes of the planning and design activities are documented in the Engineering Project Report. A quality Engineering Project Report is a foundation for a quality construction project that can proceed in accordance with its established scope, cost, and schedule and addresses the O&M costs and requirements associated with long term sustainability of facilities. It also helps to manage lapses in engineering or technical staff and can be used to manage outsourcing for construction document preparation to engineering consultants when needed.

The Engineering Project Report generally contains the following types of information, some of which can be found in the Community System Master Plan if one is available. An individual Engineering Project Report may contain only a portion of the following items or may have additional information, depending on what is needed to satisfy actual project planning and design needs.

- Executive summary that provides a concise review of the project objective, engineering efforts to date, and proposed project scope.
- Project background that includes tribal perspective, preliminary design objective and scope, and a summary of Indian homes to receive benefit from the proposed project.
- Description of the preliminary design development, for example, records review, survey and mapping, subsurface investigation, evaluation of quantity and quality of flows, hydraulic modeling, geotechnical studies, video surveys, etc.
- Estimate of future population and demands on the infrastructure. The window for the future projection shall be the design life of the proposed infrastructure.
- Alternatives considered for the project, life cycle cost analysis, and the basis for the choice of the recommended alternative.
- A robust description of the O&M requirements, costs, and capacity of the tribe to operate and maintain the alternatives considered and the selected alternative.
- Operation and maintenance organization needs and improvement plan.
- Complete description of the recommended project. This shall include a selection of major components, material, size and layout of pipes and buildings, detailed project cost estimate, operational considerations, control mechanisms where applicable, and site work.
- Assessment of jurisdiction and description of supporting documents, permits, and easements the proposed project will require.
- Discussion of general environmental requirements and the background environmental information that will be needed for NEPA determination.
- Description of construction means and methods, including bidding, construction administration, list of proposed drawing sheets, inspection, record drawings, start-up and operator training.

The effort to complete an Engineering Project Report will be proportional to the complexity of the project. The report is more detailed for more complex projects and less detailed for simpler projects. The report may be brief for simple and routine projects such as scattered site projects or for simple main extensions. The Engineering Project Report may be quite substantial for large and complex projects such as treatment facilities. The key change from historical engineering practice in the SFC program is that the fundamental design decisions are made and reported in the Engineering Project Report, before construction funding commitments are finalized.

In 2012, IHS collaborated with partners from USDA Rural Development, EPA, HUD, the Tribal Infrastructure Task Force, and the Small Communities Water Infrastructure Exchange to develop a common format to provide the design basis for sanitation projects funded by any of those entities. The interagency engineering report was intended to streamline the federal funding application process for rural sanitation projects by creating an engineering report template that is acceptable to each of the collaborating agencies. IHS has agreed to accept the common format and include those requirements in the PMPro Guideline. The common format was also intended to replace USDA Bulletins 1780-2 through 1780-4 that have been required by USDA-RD for their funding since 2003.

Some sections of the interagency engineering report may not apply to IHS projects, and the content does not vary greatly from that of the Version 11-11-11b Engineering Project Report (EPR). An important addition to the EPR template is the requirement to perform a life cycle cost analysis to assist in the comparison of feasible alternatives. Incorporating design life and life cycle costs into the SFC Program is an important step in fairly allocating funds to the tribes that we serve.

The following sections of the interagency engineering report generally will not be required for IHS-funded projects but are required for USDA-funded projects:

	Section	Title
∞	1d	Project Planning Area: Sustainability Goals
∞	2.1d	Existing Water Facilities: Financial Status
∞	2.1e	Existing Water Facilities: Water/Energy/Waste Audits
∞	2.2d	Existing Wastewater Facilities: Financial Status
∞	2.2e	Existing Wastewater Facilities: Water/Energy/Waste Audits
∞	2.3d	Existing Solid Waste Facilities: Financial Status
∞	2.3e	Existing Solid Waste Facilities: Water/Energy/Waste Audits
∞	4e	Alternatives Considered: Water and Energy Efficiency
∞	4f	Alternatives Considered: Green Infrastructure
∞	4g	Alternatives Considered: Sustainability Goals
∞	6c	Proposed Project: Water and Energy Efficiency
∞	6d	Proposed Project: Green Infrastructure
∞	6g-i	Proposed Project: Annual Operating Budget - Income
∞	6g-iii	Proposed Project: Annual Operating Budget - Debt Repayments
∞	6g-iv	Proposed Project: Annual Operating Budget - Reserves

A template and an example for the Engineering Project Report required for IHS projects can be found in Appendix 10 and 11 respectively. A digital copy of the template can also be found in the STARS library. To assist in the review for completion, a review sheet for an EPR is included in Appendix 12. The interagency engineering report template, called the Interagency Preliminary Engineering Report, can be found in Appendix 13.

4.2.2 The Community System Master Plan

A Community System Master Plan is an overall roadmap for infrastructure development. It can be specific to a community or reservation water system, sewer system, solid waste system, or some combination of these. It is the highest-level SFC planning activity, and holistically looks at the sanitation needs of an entire community or reservation. An essential component of the Community System Master Plan is the capital improvements plan. The capital improvements plan is a list of projects that may address existing deficiencies, future development needs, or both. Projects proposed to address existing deficiencies are listed on the SDS.

The Community System Master Plan differs from an Engineering Project Report in an important way. While the Engineering Project Report describes the detailed planning and design work of a single project, the Community System Master Plan usually recommends multiple projects to be constructed over a stated planning horizon, typically 20-years. Since it is a high level planning document, each individual project is only conceptually developed. Individual projects that are recommended in a Community System Master Plan can be prioritized for further development. If an individual project is likely to be funded in the near future, then it follows the same project development / planning and design process previously outlined, culminating in an Engineering Project Report.

A formalized Community System Master Plan is not needed in all situations. It is most suitable for larger and/or rapidly growing communities. This is especially true in communities with mixed-use development (i.e. commercial, services, housing) that have or need multiple proposed projects. A significant benefit of this type of planning effort is that it helps to assure that projects designed to eliminate existing deficiencies are compatible with projects identified to provide capacity for future growth.

To be successful, the tribal community must be heavily involved with developing the Community System Master Plan. The project manager's goal should be to work with the community so that the completed plan will have the support of and be adopted by the tribal governing body. A Community System Master Plan is a living document and will need to be periodically updated. A good rule of thumb is to review and publish an updated Community System Master Plan approximately every seven years. The Community System Master Plan can be either outsourced or produced with SFC in-house resources.

A Community System Master Plan generally contains the following information although actual content can be expected to vary based on specific community needs.

- ∞ General community background information
- ∞ The condition and capacity of existing infrastructure

- ∞ Overall sanitation deficiencies
- ∞ Identification of existing population, flows, quantities, and/or demands
- ∞ Current service areas
- ∞ Estimates of future population, flows, quantities, and/or demands
- ∞ Future service areas
- ∞ Capital improvement needs
- ∞ General environmental requirements for capital improvement projects
- ∞ Assessment of the operation and maintenance organization
- ∞ Operation and maintenance improvement plan

4.3 Update SDS or HPS

Upon completion of the planning and design deliverable, SDS or HPS are updated as appropriate. Typically, the update is based upon the approval of an Engineering Project Report. After it is approved, the project manager uses the community, scope, and cost information to update the conceptual project initially listed on SDS or HPS. In the case of an SDS project, the approved Engineering Project Report is attached to the project in STARS. To be consistent with the current version of the Guide for Reporting Sanitation Deficiencies for Indian Homes and Communities (SDS Guidelines), the cost estimate in the Engineering Project Report must be within plus or minus 10 percent,

In some cases, a Community System Master Plan will be the deliverable from the planning and design phase. A Community System Master Plan is a high level planning effort used to identify all existing system deficiencies, future community development needs, and proposed projects to address them. Because of this, projects identified in a master plan are usually developed at the conceptual level. If projects are newly identified, it is appropriate to enter them into the SDS or HPS at the completion of the community system master plan. Conceptual projects generated as part of a Community System Master Plan will require an approved Engineering Project Report in order to receive construction funds.

With the Engineering Project Report approved and the SDS project listing updated, the funding priority of the project can now be made based on the fully defined scope and a cost estimate. The decision to fund a project will be based upon the following as applicable: SDS priority scoring, IHS funding availability, and project partner funding availability. Project selection from SDS and HPS will follow the procedures traditionally used in the SFC program. These are fully explained in the Criteria Manual and SDS Guideline. If the project is not funded, it should be reviewed annually.

4.4 Project Documents

When funds are identified for a particular project and a decision is made to fully fund it, the IHS project manager drafts a Project Summary and Memorandum of Agreement.

4.4.1 Project Summary

The Project Summary provides information about the proposed project. It describes, in appropriate detail, the recommended sanitation facilities and the number and type of homes to be served by the project. It contains a cost estimate of the proposed project and a project implementation schedule including the proposed start date, completion date of construction, and the project completion date. The Project Summary also lists the funding sources and amounts. Chapter 8 of the Criteria Manual describes the information required for a Project Summary. The Engineering Project Report will likely contain most of the information required for a Project Summary in which case the Project Summary can reference it. A template for a Project Summary based on an Engineering Project Report is included in Appendix 15 and an example is included in Appendix 16. If the EPR does not address the following, the Project Summary should contain the following information:

- Communications Plan – List of key project stakeholders and how they will be communicated with during the remaining phases of the project.
- Procurement Plan – A discussion of what services are needed from outside contractors to complete the project and how they will be procured.
- Quality Assurance Plan – A description of how the project will be carried out to assure a high quality final product.
- Risk – A discussion of project risks and how they will be mitigated during the remaining project phases.

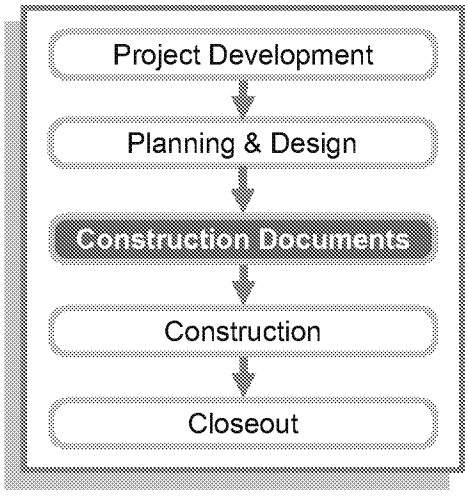
4.4.2 Memorandum of Agreement

The Memorandum of Agreement is the funding and obligating document used for direct service projects by the IHS. Chapter 8 of the Criteria Manual describes the information required for a Memorandum of Agreement. Part 5, Chapter 2 of the Indian Health Manual is the guideline for Memorandum of Agreement.

The planning and design phase ends when the Project Summary and Memorandum of Agreement are approved.

5.0 THE CONSTRUCTION DOCUMENTS PHASE

5.1 Introduction



The construction documents phase begins once the project planning document (usually an EPR), the Project Summary, and the Memorandum of Agreement are completed and approved. The construction documents phase transforms the project as described in the approved Engineering Project Report (EPR) into construction documents that are ready for issue. The construction documents phase ends once the SFC construction documents have been approved by the stakeholders and stamped in accordance with Indian Health Manual Chapter 3-24.3.A.

Construction documents are the "plans and specifications" and typically include engineering drawings, technical specifications, and other legally binding documents. Ideally specifications will include contract requirements for detailed operator training as part of the start-up requirements, as-built surveying and complete record drawings, and well defined O&M manual requirements.

The method of work (government contract, tribal procurement, 638 contract, or force account) will to some extent dictate the deliverables for this phase. The method of work should have been decided in the planning and design phase but will be reviewed in this phase.

For many SFC project managers, the work of producing the construction documents was traditionally thought of as project design work. Using that approach, planning and design work was done coincidentally with the development of plans and specifications. In similar fashion, providing operator training, as-built surveys and record drawings, and O&M manuals was historically considered to be part of project closeout. Frequently project managers under pressure to focus on the next project design neglected to adequately furnish these items that in turn created challenges for tribal utilities charged with assuming operation and maintenance of completed facilities. In the project structure described in the PMPro, the design work is already complete and O&M requirements have already been established before the plans and specifications are produced. This phase is complete when the construction documents are approved.

5.2 Planning Document Review

The construction documents phase begins with a review of the work completed in the previous phase. Typically this requires a review of the Engineering Project Report to ensure that the planning remains valid, especially if significant time has elapsed since the EPR was completed. The project manager and project team members should conduct this review collectively. The primary goal of this review is to validate previously identified information, deficiencies to be addressed, and site conditions. The EPR requirements are found in Section 4.2.1 which

describes the items that will be needed to prior to developing the construction documents. At a minimum, the following items will be reviewed:

- Scope and orientation of the project including objective and deficiency to be addressed
- Planning and design activities completed to date
- PDP, EPR, PS, and other pertinent documents
- Project assumptions and constraints
- Items that are complete, need to be re-evaluated, are in progress, and are still needed.

Figure 5.1 is a schematic that shows an overview of the construction documents phase. A detailed explanation of this phase is provided in this chapter.

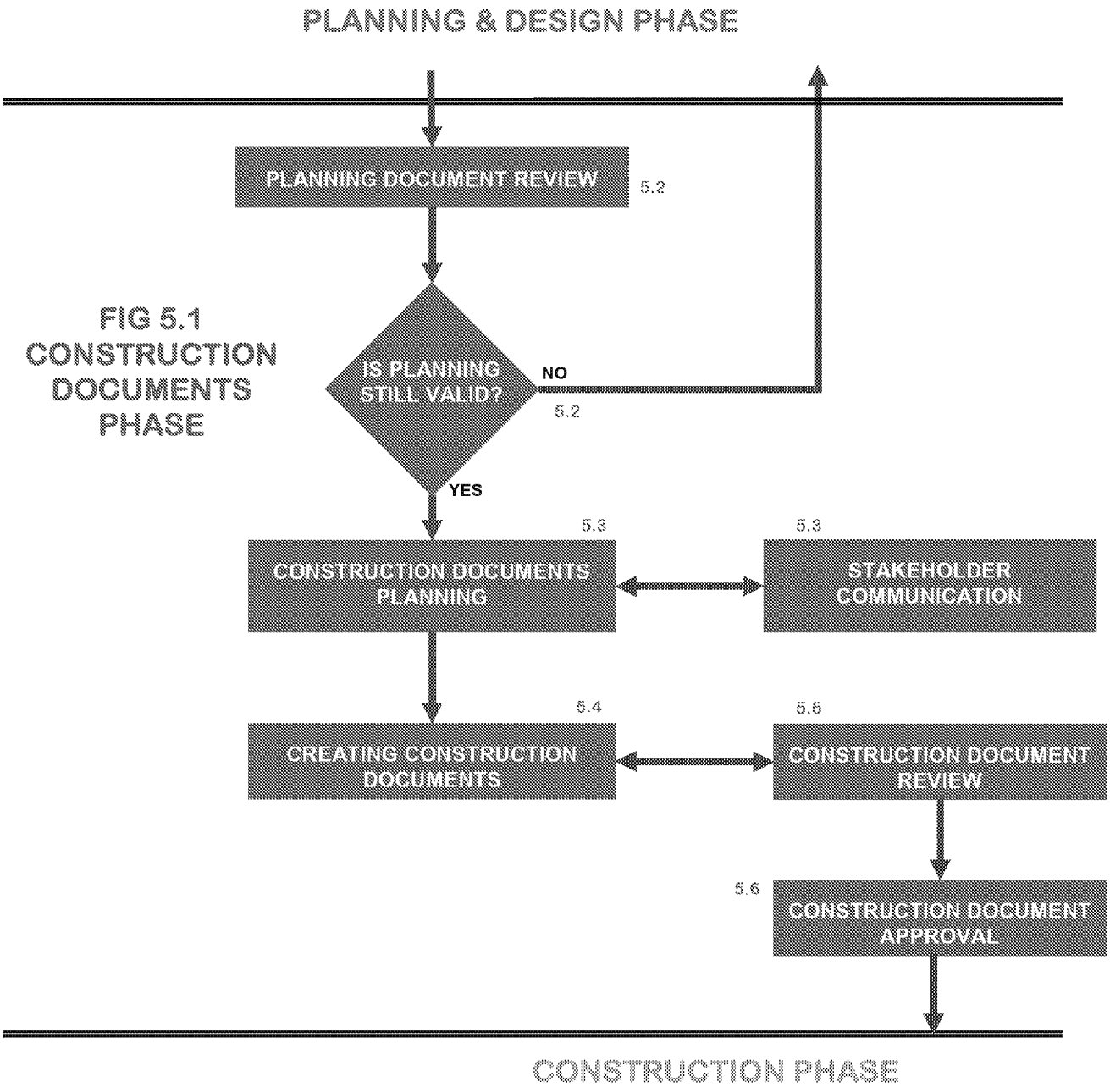


FIG 5.1 CONSTRUCTION DOCUMENTS PHASE

5.2.1 Scope Review and Orientation

Most if not all of the major decisions and elements of project design should have been identified in the EPR which was completed as part of the planning and design phase. This document and the Project Summary should be thoroughly reviewed to determine if all design work and project assumptions are current. Additionally, the project manager should verify that no further design work is necessary to move forward with the construction documents phase. A site visit may be necessary to verify that conditions have not changed.

The project budget should also be reviewed at this stage in the process. It is imperative the team understand what facilities have and, maybe more importantly, have not been proposed through the development of the PDP, EPR, PS, MOA and related documents. Developing construction documents that propose more facilities than outlined in the EPR can lead to a budget shortfall.

If the review of the planning and design activities leads to the conclusion that additional design is required, that should be completed prior to initiating construction documents development to ensure efficiency during this phase.

5.2.2 Stakeholders Meeting

The time interval from the approval of the EPR, Project Summary (PS) and MOA and beginning of the construction documents phase can be significant, sometimes as much as three years. Because of this timeframe, the stakeholders (IHS staff, tribal representatives, etc.) involved at various phases of the project may have changed. In that case, it is critical to bring the current stakeholders together at the beginning of the construction documents phase to review the scope and objective of the project. The major design decisions and elements of the project should have been identified in the planning and design phase and documented in the EPR. This stakeholders meeting will primarily be a review of that previous work.

In addition to the IHS project team, external stakeholders may include tribal representatives, federal funding partners, and staff and managers of the tribal utility that will operate and maintain the completed facilities. Communication with the stakeholders should not end with this EPR review and will continue throughout the construction documents phase.

5.2.3 Construction Document Deliverables Review

Although the documents required for the construction phase should have been identified in previous phases, the project team should confirm the deliverables during the scope review. If the deliverables have not been identified, that can be done in this phase. This deliverables review will likely consider the following:

- Type of procurement
- Anticipated construction document groups, for example, separate document groups for a tank, well, and pipeline
- Anticipated plan sheets and scale
- Anticipated detail sheets

- Anticipated specialty sheets, for example civil, architectural, electrical, mechanical, structural, instrumentation, process, etc.
- Anticipated specification sections and formats
- Anticipated contract documents sections to be included with the specifications

The project team should clearly understand the construction method to be used because tribal, federal or other construction procurement method will require different contract documents.

By visualizing the final product, the team can create an ordered list of anticipated drawing sheets and details to be used. The team should also assemble a list of specifications sections to be used. This is a good time for the team to discuss the measurement and payment items for the work. Discussing this now can help prevent measurement and payment item inconsistencies between the plans and specifications.

The administrative requirements, if any, should also be acknowledged as part of the review process. Requirements such as pre-bid conferences, Tribal Employment Rights Office (TERO), Davis-Bacon wage requirements, contract times and schedules, liquidated damages, bonding, and insurance should be identified early in the process so they may be incorporated into the construction documents.

Although this will vary substantially based on the scope and complexity of a specific project, the construction documents may typically include these deliverables:

Construction Drawings

- General drawings
- Civil drawings including existing site, topography, and utility plan
- Architectural drawings
- Structural drawings
- Process drawings
- Instrumentation drawings
- Electrical drawings
- Mechanical drawings

Specifications

The Construction Specifications Institute (CSI) MasterFormat is recommended although some IHS Areas continue to have a strong commitment to the technical provisions format. Based on the CSI format, the construction documents may typically include these divisions:

- Bidding & contracting requirements
- General requirements
- Technical specifications

5.3 Construction Documents Planning

In addition to the project design, ideally the Engineering Project Report will also include a general description of the construction documents needed. If the design is still valid, the next step in the construction documents phase is to develop a plan for translating the design into

construction documents. The project manager and team members should do this collectively. This plan should identify deliverables, assign tasks, and establish a schedule for completion of the work. Issues to be determined may include the following items:

- Special circumstances
- Deliverable review
- Communication plan
- Task list or work breakdown structure
- Quality control procedure for review of the drawings
- Task assignments and milestone schedule

5.3.1 Special Circumstances

Often times the project team will need to accommodate special circumstances or manage unique elements of a project. The project team should make note of any special circumstances associated with the project and how they may impact the development of the construction documents and the construction process. These circumstances will assist with the accurate development of the construction document completion schedule. The goal is to make sure completion of the construction documents is well-timed.

Special circumstances may include the following:

- Special construction schedules
- Special design disciplines
- Specific agency documents or requirements including special agency review
- Known significant milestones (weather, NEPA, etc.)
- Coordination with other work, contracts, agencies
- Coordination with other IHS Offices and Divisions, for example, the Division of Acquisition Policy when the method of work is federal procurement or 638 contracting

Some funding agencies may require an agency-specific document in the construction documents or may require a review at designated completion intervals. In such cases it will be important to account for those items when developing the completion schedule. Weather and environmental issues often dictate the timeframe for construction of a project. These types of construction circumstances may require the project team to adjust the document completion schedule to accommodate these constraints.

5.3.2 Resource Management

A task list is used to identify the discrete elements of construction documents production and prioritize those elements. At a minimum the project manager will provide a task list that defines the principal tasks. For complex projects where a task list does not provide enough detail to manage the production of the construction documents, a work breakdown structure (WBS) may be required. The choice of WBS or task list will depend on a number of variables including the complexity of the project, the number of team members, and the experience level of the team members. For most SFC projects a task list will be sufficient to effectively manage the construction documents phase.

After the task list or WBS is developed, the tasks associated with the construction documents production will be assigned to individual team members. Completion dates will also be assigned to each task or group of tasks. The special circumstances described Section 5.3.1 must be considered if they will affect the timeline. A Gantt chart spreadsheet or commercially available project management software may be used to provide an easy to read format for the schedule. Such programs can identify and help manage interdependencies between tasks and resources. Microsoft Project is the software tool selected to support the SFC PMPro.

Scope creep and resource over-loading are often causes for missing a task deadline. Scope creep in project management is a phenomenon where the scope increases because new products or features are added to a previously approved project design. The project manager must regularly review and update the schedule as the construction documents are developed. Tasks taking longer than anticipated must be scrutinized to determine cause of delay and impact on the entire project.

5.3.3 Develop Communication Plan

A communication plan is an important part of the contract document phase. The plan identifies the key players in the document completion process and when they will interact. At a minimum it should list the project manager (and lead team member for the phase if it is not the project manager), the team support staff, the process and party or parties responsible for quality assurance and control (QA/QC), cost control measures and the frequency of status updates and team meetings. Specifically, the plan will describe these items:

- Name, contact information, and role of the project manager and all team members
- Process for delivering documents to reviewers and receiving comments
- Team meeting schedule
- Quality control procedure for review of the drawings
- Development schedule that minimally includes 50%, 90%, and complete documents milestones

5.4 Creating the Construction Documents

Much of the project work designed and specified by SFC engineers is routine, and standard specifications and drawings can be used. This is typically not the case for O&M related items. These are typically driven by the complexity of the installed infrastructure. For example, the construction documents for a water line extension project may only require as-built surveying and record drawings but those for a mechanical treatment plant may require long term operator training as part of the construction contract. In cases where tribes or owners of the constructed facilities have specific local standards these will be reflected in the construction documents. All engineering plans, calculations, specifications, and reports shall be prepared by, or under the responsible charge of, a registered engineer in accordance with the licensing requirements, administrative rules and regulations of the state in which the engineer is licensed.

Drawings will typically be developed using Autodesk software. The SFC program supports AutoCAD, Autodesk Civil 3D, and a variety of allied software products at the national level. A standard IHS drawing template is maintained by the AutoCAD managers group and will be used

as the basis for SFC construction drawings. This template is designed for use with Civil 3D and includes styles, symbology, and format to ensure consistent looking drawings. Specific Area standards and formatting may additionally apply.

5.4.1 Drawings

Regardless of the method of construction, the drawings should be of the same quality, clarity and format. The SFC program has standard drawing templates. A complete Engineering Project Report will list the required drawing sheets and may include draft drawings. Depending on Area requirements and the complexity of a specific project, the construction drawings may include the following sheets.

General Drawings
- ∞ Title page
- ∞ Index sheet or location map
- ∞ Rights-of-way/easements
- ∞ Standard details, general notes, and legend
- ∞ Design analysis sheet

Civil Drawings
- ∞ Site plan
- ∞ Existing site and topography
- ∞ Demolition plan
- ∞ Utility plan
- ∞ Grading plan
- ∞ Plan and profile (water and sewer mains)
- ∞ Profiles and cross sections
- ∞ Details and general notes

Architectural Drawings
- ∞ Site plan
- ∞ Floor plan
- ∞ Demolition plan
- ∞ Ceiling plan and systems
- ∞ Roof plan
- ∞ Exterior elevations
- ∞ Building sections
- ∞ Wall sections
- ∞ Room finish schedule
- ∞ Door and window schedules and details
- ∞ Interior elevations
- ∞ Miscellaneous details and general notes
- ∞ Equipment layouts

Instrumentation Drawings

Structural Drawings
- ∞ Foundation plan
- ∞ Floor and roof framing plans
- ∞ Elevations
- ∞ Sections, details, and general notes

Mechanical Drawings
- ∞ Demolition plan
- ∞ Site plan
- ∞ Mechanical plans
- ∞ Plumbing plan
- ∞ Elevations and sections
- ∞ Details and general notes
- ∞ Equipment schedules

Electrical Drawings
- ∞ Site plan
- ∞ Floor plan
- ∞ Demolition plan
- ∞ Ladder and layout diagrams
- ∞ Notes, legend, and symbol list
- ∞ Schedules and tables
- ∞ Sections and details

Process Drawings

- Instrument loop drawings
- Control diagrams
- Sequence of operations
- Process floor plan
- Demolition plan
- Elevations and sections
- Details
- Equipment schedules

A quality control procedure for review of the drawings identified in Section 5.5 must be implemented before they are signed and sealed. If interim engineering documents are stamped and signed they shall include a notation as to the intended purpose of the document, such as "preliminary", "draft", "not for construction", "for plan check only", or "for review only."

5.4.2 Specifications

Regardless of the method of construction, the specifications should be of the same quality, clarity and format. Individual Areas may have standard specifications to establish uniform administrative procedures and quality of constructed facilities. These may include specific requirements for materials and workmanship. Specifications for a particular project or contract must be adapted to the specific work and therefore may require modifications and additions. The project manager or lead project engineer should thoroughly review the standard specifications and make the appropriate changes and modifications as necessary.

Most Area SFC programs currently use standard specifications although some use technical provisions. The specifications or technical provision must describe the design generally and the products and execution specifically. Unless the Area has a specific format to specify construction the Construction Specifications Institute (CSI) MasterFormat is recommended. MasterFormat 1995 is the 16-division format typically used by SFC project managers and is recommended for use on SFC projects. MasterFormat 2004 and 2011 contain 49 and 48 divisions respectively and are acceptable alternatives when CSI specifications are used.

Divisions 0 or 00 of the MasterFormat 1995 and 2004/2011 respectively provide the procurement and contracting requirements for a construction project. Divisions 1 or 01 of those versions provide the general requirements for a construction project. The Engineers Joint Contract Documents Committee (EJCDC) agreement is recommended for the contract agreement when the method of work requires such a document. Other formats including the FAR bidding and contracting documents include the same basic clauses and provisions. Together the general, procurement, and contracting requirements for a construction project are typically called the "front end documents".

Depending on the method of work selected for a specific project, additional contract documents may be required. This is particularly true where federal contracting will be used. The Federal Acquisition Regulation (FAR) has specific requirements that may require additional documents. The project team will be responsible for developing these additional documents in conjunction with the federal or tribal contracting officer (CO).

The technical specifications describe the project in detail and include site construction, concrete, masonry, metals, wood and plastics, thermal and moisture protection, doors and windows,

finishes, specialties, equipment, furnishings, special construction, conveying systems, mechanical, electrical, telecommunications, and instrumentation.

For most SFC construction projects the bulk of the construction documents will be technical specifications. The Engineering Project Report will ideally identify sizes, types, and performance standards for construction, equipment and materials. The EPR may also identify specific specifications to include in the construction document specification section. Certain technology and vendor products change over time and consequently care should be used when translating EPR specifications into the final construction documents to ensure that up to date specification information is used.

Regardless of the format of the drawings and specifications, the construction documents package must provide enough detail to fully bid and construct the designed project. The construction documents provide the administrative, technical and procurement language governing the project construction. As a result, the drawing and specification documents together must completely describe the methods of work and desired end product. Appendix 17 includes a description of the CSI MasterFormat 1995 which is the most commonly used format for SFC projects.

The final document stamp/seal requirements included in the Indian Health Manual Part 3, Chapter 24 will be followed for SFC construction drawings and specifications.

5.4.3 O&M Requirements

The operational perspective is essential to the long term success of the project and those responsible for O&M are key project stakeholders. The staff of the O&M entity that will operate and maintain the completed facilities and the respective IHS O&M coordinator must be included in the project beginning with the concept phase. Their review the construction documents is critical. All project deliverables to support the operation and maintenance of the completed facilities must be described by the construction documents. Examples include:

- O&M supplies including spare parts, tools, treatment chemicals, filters, etc.
- O&M training, typically provided by the contractor or equipment suppliers and vendors. The O&M training should be provided prior to final payment and utilize the O&M manual. In force account construction the tribe or IHS may be responsible for the training.
- O&M manual, typically provided either by the contractor or equipment suppliers and vendors. The O&M manual should be available during the O&M training. In force account construction the tribe or IHS may be responsible for the manual.
- As-built survey to provide data for the completion of the record drawings (as-builts).
- As-built/record drawings to provide information either as marked-up construction drawings or completed as-built record drawing. The contractor typically provides the as-built information when the method of work is federal or tribal procurement. In force account construction the tribe or IHS may be responsible for the information.

5.4.4 Safety Strategy

All Occupational Safety and Health Administration (OSHA) standards apply to IHS projects, even when constructed on tribal lands. The contractor/builder is typically responsible to establish and maintain a safety and health program for the work site that provides adequate policies, procedures, and practices to protect employees and the community from job-related safety and health hazards.

A formal construction safety strategy must be developed during the construction document phase to ensure any elements required for inclusion in the construction documents are identified. The requirements will vary widely depending on the method of work. The Occupational Safety and Health Administration (OSHA) regulations in Title 29 of the Code of Federal Regulations (29 CFR) include a complete list of worker health and safety standards. 29 CFR 1910 includes the standards for general industry and 29 CFR 1926 includes those for the construction industry.

The strategy must be developed in enough detail to ensure that all parties to the project have a mutual understanding of the specific site conditions, including traffic, nearness of structures and their conditions, soil conditions, surface and ground water conditions, overhead and underground utilities, and weather.

These major elements are typically included in the construction safety strategy:

- CPR and first aid equipment
- Accident and injury reporting
- Personal protective equipment requirements addressing dust masks, safety goggles, ear protection, safety footwear, hard hats, and gloves at a minimum
- Excavations and trenching protocols
- Blasting procedures and monitoring
- Ladder safety
- Confined space requirements
- Lock out/tag out procedures
- Electrical safety
- Traffic control
- Nuclear soil moisture/density gauge handling and safety
- Use of vehicles (for some methods of work)

5.4.5 Construction Schedule

Although a preliminary construction schedule will have been developed as part of the engineering project report, a final schedule that defines construction tasks and milestones must be created as part of the construction documents. Preliminary schedules from previous phases will be referenced. Depending on the method of work, this may be used to assign contract times. The construction schedule developed in this phase must include enough detail to accurately assess the various bid times and duration of construction as these may establish hard constraints for the bidding process and for permits and contract terms. The schedule may also be used to evaluate the builder's progress schedule, submittal schedule and/or schedule of values and to provide the basis on which to evaluate actual performance.

The STARS milestone schedule must be updated based on the construction schedule.

5.4.6 Engineer's Estimate

After the construction documents are complete the Engineer's Estimate must be updated to reflect the final design. Interim and final updates to the estimate must be frequently compared to the project budget to help mitigate budget overruns. This estimate will be used for project budgeting and to establish obligation amounts, during the procurement process, and to manage force account efforts. It will provide the basis for evaluating contractor bids as fair and reasonable cost to the Government if the method of work requires bidding. It will also define the cost items against which to collect bid abstract data for historical purposes.

5.5 Construction Document Review

The work flow and local hierarchy at specific SFC offices will likely dictate the review process. At a minimum construction documents will be reviewed by the project manager, at least one peer, and a representative of the tribe to whom completed facilities will be transferred. Individual Areas may have specific review policies and those policies or guidelines will prevail over the Project Management guideline if they vary. For most SFC projects the minimum level of review will be by the project manager first and then by the District Engineer followed by tribal review.

Prior to review, and ideally as part of the communications plan described in Section 5.3.3, the process for delivering documents to reviewers and receiving comments will be clearly defined and communicated to all potential reviewers. Normally reviews will correspond with the milestones included in the development schedule. Section 5.3.3 identifies these as 50% 90%, and complete documents at a minimum.

Stakeholders and funding contributors may also request review. In cases when a funding contributor desires to review construction documents, the protocol for that review will be defined in the agreement between the contributor and IHS. Agreements to review will specify frequency of review, review period, and method of communicating comments.

Scope creep has historically been a factor in SFC projects and one of the primary objectives of the PMPro implementation is to manage scope and deliver completed projects on time and on budget. Extended reviews and a review process that is not clearly defined at the beginning of documents development has traditionally led to scope expansion. Staff turnover at any of the stakeholder organizations can exacerbate the possibility of scope creep when new points of view emerge. Timely documents review is essential to manage scope creep. Local conditions will dictate the review schedule

If an Engineering Project Report was completed with the level of detail described in Chapter 4, construction documents can be completed relatively quickly, ideally in three months or less.

5.6 Construction Document Approval

As with the documents review, the work flow and local hierarchy at specific SFC offices will likely dictate the approval process. Individual Areas may have specific approval policies and those policies or guidelines will prevail over the Project Management guideline if they vary. Individual project documents will be informally approved as they undergo review, but documents are not considered approved until they are stamped in accordance with the Indian Health Manual Part 3, Chapter 24. Final approval will rest with the individual whose stamp appears on the construction documents.

The project engineer (if registered) will sign and stamp the construction documents following completion of the quality control review process. The District Engineer will sign and seal the work if the project engineer is not registered. If a project requires multiple engineers, the lead electrical, civil, structural, chemical, geotechnical, mechanical engineers, or registered land surveyors should sign and seal all drawings of their discipline for which they performed or directed the work. This may be applicable if specific portions of the work are completed by A/E consultants.

The decision about who will sign and seal professional work products will be made by the District Engineer. Drawings and plans are required to be signed and sealed or stamped on each sheet of the document.

The Indian Health Manual Chapter 3-24.3.A describes the final approval for construction documents in this way:

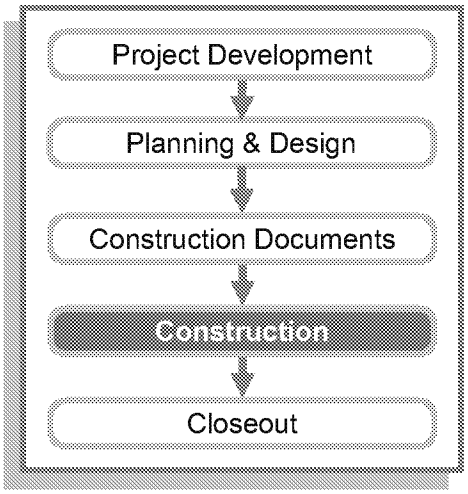
"Final Documents. The title and/or index sheet of all final documents shall be signed and sealed by a Registered Architect/Professional Engineer. Only the cover page of the specifications for a construction contract shall be stamped/sealed by the architect or engineer in charge of the work depicted in that specification. Each drawing, other than the title and/or index sheet, shall be signed and sealed by the Registered Architect or Professional Engineer in charge of the work depicted on that drawing. Drawings prepared by a consultant to the prime architect/Engineer may be signed and sealed by the consultant. Drawings prepared by IHS professionals (in-house designs) shall be signed and wet-sealed as directed by the Division Director, District Engineer, and/or designated Area Officer. Final drawings (full size) and other documents (specifications) shall bear original signatures and wet seals. A permanent (Mylar) hard copy of the "final documents" will be maintained by the IHS at one of the following locations:

1. The original licensed Professional Engineer's/Registered Architect's office,
2. the approving office, or
3. an office designated by the program."

For unusually large or complicated projects, the key project team members may meet after the construction documents are complete to reflect on the process and identify best practices of the work as well as areas for improvement. The team should also compare the original schedule against the final updated schedule. This feedback process will help the team increase efficiency and enable them to create more accurate and realistic schedules for future projects.

6.0 THE CONSTRUCTION PHASE

6.1 Introduction



The construction phase begins once the SFC construction documents have been approved by the stakeholders and stamped in accordance with Indian Health Manual Chapter 3-24.3.A. This phase typically includes obtaining prices for the work, constructing the work, certifying the work is constructed as planned, and final acceptance of the work. The construction phase ends when the facilities constructed are in operational condition and they are accepted by the owner. Each Area may have specific documents required to certify construction completion.

This may be the most familiar and visible phase of an SFC project. This phase includes specific processes that may vary depending on the procurement methods and Area standards. As a result, this guideline does not describe each construction phase process in detail but does describe the application of project management principles to the phase processes.

The phase begins with bidding and contractor selection when federal or tribal procurement (MOA procurement) is the method of work. When a 638 contract or tribal force account is the method of work, the phase begins with a negotiated agreement between the IHS and tribe or tribal organization. Bidding and contractor selection are not required when the method of work is federal force account. Recent surveys indicate that the SFC Program utilizes tribal procurement for 80% of construction projects.

It is during this phase that the sanitation facilities described in the construction documents are built. For some projects, operator training, O&M manuals, as-built surveys and other O&M related items required in the contract documents are begun or completed during this phase. Construction inspection, quality control, payment of work, and acceptance of work are all activities completed in this phase. The phase is complete when the facilities are constructed and in operational condition and the owner has accepted them. Individual Areas may have specific documents required to certify construction completion.

As with all project phases, the "plan, do, and check" methodology is effective in the construction phase. The processes which must be considered by the project manager during the construction phase include the following:

- Planning - preparing for construction including document review and planning meetings.
- Initiation - executing construction including information distribution, assigning resources, procurement, and pre-construction conference.
- Tracking - monitoring & controlling construction quality, schedule and costs.
- Completion - accepting construction including final inspection, final payment, and warranty.

6.2 Construction Documents Review

Preparing for the construction phase begins with a thorough review of work completed in previous phases. An important objective of this review is to clarify the method of work which will determine the IHS role in the construction phase. The method should have been chosen in the planning and design phase. Based on that decision, the appropriate procurement documents were prepared in the construction documents phase. A review of the construction documents will identify contract requirements, the scope of the work as defined in the plans and specifications, and the budget and schedule for the construction phase.

6.3 Construction Planning

Beginning the construction phase without proper planning often leads to mismanagement throughout the phase. Examples of this include attempting to procure services without understanding the constraints of the contract documents, proceeding with construction without understanding the roles and responsibilities of all parties, approving payment for work which was unacceptable or mishandling change requests. These problems can lead to budget shortfalls, schedule overruns, scope creep, and strained relations amongst the stakeholders. The project manager has to thoroughly understand the work to be completed in the construction phase and ensure that sufficient planning has been done to ensure successful completion.

At a minimum, preparation for construction planning must include the following:

- Document review to ensure understanding of the project scope, procurement method, work breakdown structure (WBS), budget & estimates, resources, and schedule
- Development of a construction phase communications plan
- Evaluation of construction risks
- Planning meeting

6.3.1 Construction Planning Meeting

For projects that are large, complex, or politically sensitive, a construction planning meeting may be required to allow all tribal and federal stakeholders to communicate and address concerns and responsibilities prior to initiating the construction phase. The primary objective of this meeting is to ensure that these stakeholders have a common understanding of the project and the outcome of the construction phase. The method of work will dictate which parties attend the construction planning meeting. Typically the following parties will participate:

- Project manager and lead project engineer if that is not the same person
- Utility (O&M) Consultant
- District engineer (DE)
- Federal contracting officer (CO)
- Tribal utility organization representative
- Tribal construction crew representative

The SFC project manager will coordinate the meeting and agenda. At a minimum, items for discussion will include the following:

- Construction work method and procurement documents

- O&M related requirements that will begin in this phase
- IHS role, tribal expectations and coordination of the IHS and tribal personnel
- Budget, scope, and schedule
- Communication plan
- Insurance
- Safety
- Surveying and site staking
- Potential risks and problems that may impact the construction phase, and strategies to mitigate those risks and resolve problems. An example risk management checklist can be found in Appendix 5

6.3.2 Resource Management

The project documents will generally include requirements of the IHS and tribal agencies. These documents will outline specific rights and responsibilities to the owner, the contractor, the engineer, and the engineer's representative. A resource management plan may be required depending on the IHS role in the construction phase. This plan will detail personnel and equipment assignments for the tasks required of IHS. All team members must be aware of their responsibilities and expectations for the project. If any of the team members are supervised by others not on the team, the project manager will be responsible for coordinating with those external supervisors.

In some cases the IHS role in the construction phase is complex enough make a work breakdown structure (WBS) necessary. The WBS will provide information on the resources needed to complete the work, how the resources will be coordinated with the work packages outlined in the WBS, and a schedule for the expected completion. It will be the responsibility of the project manager to ensure that the methods and project work are feasible and that all stakeholders understand their responsibilities.

6.3.3 Develop Communication Plan

A construction phase communication plan is critical to prevent mixed expectations and misunderstanding in the quick-moving construction phase. The plan identifies the key players in and when they will interact. The plan is developed prior to construction initiation and will be modified to include potential bidders when procurement begins and the successful bidder after the work is awarded.

At a minimum the plan will list the project manager (and lead team member for the phase if it is not the project manager), the team support staff, the process and party or parties responsible for quality assessment and control (QA/QC), cost control measures and the frequency of status updates and team meetings. Specifically, the plan will describe these items:

- Name, contact information, and role of the project manager and all team members
- Name, contact information, and role of the contracting officer (CO) and contracting officer's technical representative (COTR)
- Name, contact information, and role of the contractor and construction superintendent
- Process for delivering documents between parties and for communicating comments

- Team and construction progress meeting schedule
- Construction schedule

6.4 Construction Solicitation and Initiation

The project manager's role during the initiation of construction will largely depend on the method of work and the size and complexity of the project. When tribal or federal procurement is used as the method of work, the project manager provides an advisory role to the federal or tribal contracting officer who assumes the lead procurement role. When 638 contracting is the method of work the project manager will also provide an advisory role to the federal contracting officer who assumes the lead procurement role and may serve a lead role in negotiating agreement with the tribe. When federal or tribal force account construction is the method of work the project manager may have the lead role and may direct construction activities.

Regardless of the method of work, these are the general activities that occur to initiate and execute the construction:

- Information distribution and communications with stakeholders and potential bidders
- Assigning resources based on the IHS role
- Assist with procurement including providing technical support to the contracting officials, conduct the pre-bid conference, respond to bidder questions and provide clarifications
- Advise the procurement official on award of the work
- Conduct the preconstruction conference

6.4.1 Information Distribution and Pre-Bid Conference

A key responsibility of the project manager during construction initiation is to ensure efficient flow of information between project stakeholders and interested parties. The communication plan described in Section 6.3.3 provides the strategy to communicate throughout the construction phase. During construction initiation this is typically done through pre-bid conferences, email and written responses, telephone calls, the pre-construction conference, and regularly scheduled meetings.

Checklists provide a valuable resource for standard communication such as the pre-bid conference. An example checklist can be found in Appendix 18. It is extremely important to maintain an accurate record of the pre-bid conference.

6.4.2 Procurement

Depending on the method of work, procurement can take from 14 to 120 days. Procurement activities generally include printing the construction documents, conducting pre-bid meetings, answering bidder questions, preparing addenda to bid documents, bid advertisement, bid evaluation, award recommendation, and contract preparation. The solicitation process concludes with the award of the construction contract and the issuance of a notice to proceed to the selected contractor. Some of the work methods used for SFC projects may also require other procedures to prepare for construction.

If the construction work is to be competitively bid by a federal or tribal official, the procurement process will begin with the delivery of the construction documents to potential bidders. This is typically done through journals, publications, construction documents bureaus, or personal contact. It is critical to maintain of registry of parties who obtain construction documents. This registry will be useful if addenda or other communications to potential bidders become necessary during the bidding process.

For projects that are large, complex, or politically sensitive, the project manager may wish to hold a pre-bid conference for potential bidders. The need to do this will be included in the communication plan. The pre-bid conference provides an opportunity for contractors/builders to visit the site, to inquire or clarify various elements of the scope of work, and to ask questions about contracting procedures or other aspects of the proposed construction and/or contract. Items typically discussed at the pre-bid conference include the following:

- Description and location of the project
- Bid dates, due dates, and where to send bid
- Documents required for a complete bid
- Amendments or changes
- Requirements associated with the Tribal Employment Rights & Ordinances (TERO)
- Any other unusual requirements

The project manager must have a clear understanding of the construction documents when bids are advertised, received, and opened. Frequently the project manager will need to clarify the requirements of the documents and ensure that a contract is awarded in a timely manner, legally, and in the best interest of the tribe and government.

6.4.3 Bidding and Award

The construction documents prepared in the construction documents phase will specify the length of time the project will be advertised for bid, due dates, where to send bids, format, and documents required for a complete bid. Any bid received that does not meet all of these specifications will be deemed non-responsive and must be rejected.

It is not uncommon for questions to arise from potential bidders during the advertisement period. The project manager or designated representative must answer those questions completely in a timely manner. Failure to do so can lead to complaints of bidding irregularity which can delay the award of a contract and may even require re-bidding. If additional information must be supplied by the project manager to answer a question, the same information must be supplied to all other bidders and potential bidders. Typically this requires an addendum to the construction documents which is sent to all registered bidders and the journals, publications, construction documents bureaus, and personal contacts used at the onset of the bid advertisement.

At the conclusion of the advertisement period, the project manager will publically open all bids on the date and at the time and place indicated in the bid documents. Typically the winning bid will be the lowest-cost responsive bid although there is a trend in federal contracting to make awards based on a range of criteria, not just low price. Federal contractor performance is

typically documented in the Contractor Performance Assessment Reporting System (CPARS) and that can be used to formally evaluate past performance.

To be responsive a bid must contain all of the information, documents, pricing, and other information described in the bid documents. If there are criteria other than price for selecting the winning bid they will be described in the bid documents. The project manager will make a recommendation for award in the form of a letter to the tribe for tribal procurement or a memo to Contracting/Acquisitions for federal procurement.

Unless a bid protest is filed by an unsuccessful bidder, a notice of award will be prepared by the contracting officer and issued to the successful bidder who will then submit any additional requirements the construction documents may require. Typically a notice to proceed will then be issued which defines the dates of the construction.

When the method of work is a 638 construction contract the bidding process is not used. In those cases the federal contracting officer will negotiate the terms of the contract with the tribe that will perform the work. In those projects the role of the project manager will be to advise the CO to ensure that the project described in the construction documents can be successfully completed with the funding available for the project. The technical aspects of the project will not change but the contractual and administrative aspects will be very different with this method of work. One of the goals of the IHS and of the SFC strategic plan is to fully support tribal self governance and when construction will be completed using a 638 construction contract the project manager has an opportunity to advance that goal.

6.4.4 Pre-Construction Conference

Some form of preconstruction conference is recommended for every SFC project, although the scope and specificity of the meeting will vary with project size, complexity, and method of work. The communication plan that was reviewed during construction planning will include the requirements for the preconstruction conference.

The preconstruction conference will minimally include representatives from the contracting office or tribe, IHS, builder and/or contractor as appropriate depending on the method of work. In some cases additional representatives may include sub-contractors, other funding agencies, environmental personnel, and state or local agencies. It should be emphasized that the purpose of the meeting is not to change the contract or scope. The objective of the conference is the following:

- ∞ Ensure that all participants have a clear and mutual understanding of all contract, technical, and construction requirements
- ∞ Ensure that all parties understand their roles and responsibilities during the construction phase
- ∞ Identify and resolve potential administrative problems
- ∞ Establish the identity and responsibilities of representatives of both parties

At this preconstruction conference the project manager will normally present any work completed during construction planning, including resources allocated for the project (surveyors,

construction inspectors, etc.) and the plan for information distribution during the contract. The project manager may also present a schedule and process for submittal reviews and approvals. Contract time extensions, change order process, weather delays, and the authority of the contracting officer's representative (COR) must also be explained and discussed during this meeting.

The contractor will normally be expected to submit their construction management expectations as well. The contractor may present a schedule for project completion, a schedule of work values, and schedule for submittals. Other aspects to discuss may include workplace safety, insurance coverage, bonds, utility conflicts, and anticipated risks.

Checklists provide a valuable resource for standard communication such as the Pre-Construction Conference. An example checklist can be found in Appendix 19. It is extremely important to maintain an accurate record of the preconstruction meeting.

6.5 Construction Safety

All Occupational Safety and Health Administration (OSHA) standards apply to IHS projects, whether or not they are constructed on tribal land. The method of work will determine the party responsible for job site safety. This must be established before construction begins and clearly communicated at the pre-construction meeting and reinforced as necessary. The contractor or builder is responsible to establish and maintain a safety and health program for the work site that provides adequate policies, procedures, and practices to protect employees and the community from, and allow them to recognize, job-related safety and health hazards.

Safety on the project site should be reviewed and emphasized before construction activities begin. Construction site safety will involve many parties including the contractor, the project manager, construction inspector, and the tribe and surrounding community. The safety review will include all major elements to construction site safety including the following:

- Use of vehicles and traffic control
- CPR, first aid, accident and injury reporting
- Personal protective equipment
- Tank sand blasting and painting
- Excavations and trenching and blasting
- Ladders, confined space
- Electrical and lock-out/tag-out procedures
- Nuclear soil moisture/density gauge and hazardous materials

6.5.1 Responsibility

Job-site safety is not normally the responsibility of the project manager but adequate initial planning and on-going attention to safety issues can significantly reduce on-the-job accidents. The project manager and contractor or builder must have a mutual understanding of the specific site conditions be taken into account. At a minimum these include traffic, overhead and underground utilities, nearness of structures and their condition, soil, surface and ground water, and weather conditions.

The role of the project manager is not to serve as a safety inspector. However that person and other IHS staff must remain vigilant that there are no flagrant safety violations occurring on the site. IHS personnel shall not direct the contractor's workmen on the use of specific methods, construction equipment, or tools, nor shall they at any time operate or assist in the operation of contractor's equipment. Further, IHS personnel providing construction inspection and review services shall not assume responsibility for the safety of the contractor's operations or work site. It is not the responsibility of IHS personnel to grant or express approval of the contractor's methods or degree of safety protection.

The contractor or builder has full responsibility for the safety of the construction operations and is expected to ensure the safety of IHS personnel on the job site performing inspection services, however IHS employees shall not place themselves in unsafe conditions.

It is important that the project engineer or inspector record any observations, notifications, or directions to the contractor in the log and the weekly construction report. Photos of safety violations may become important to substantiate these observations.

6.5.2 Insurance

The contractor and/or tribe performing the work by tribal force account require some form of insurance that must be provided and maintained during the project. Although the method of work will determine the insurance requirements, they must be included in the construction documents. Insurance likely will include worker's compensation, employer's liability, comprehensive general liability (bodily injury), comprehensive automobile liability (bodily injury and property damage) insurance, and such other insurance as may be required by applicable laws and regulations.

6.5.3 Construction Site Hazard

Communications about construction site hazards will be described in the communications plan and will be determined by the method of work, but the communications are generally described here.

If the project manager, inspector, or another IHS official observes an obvious work-site hazard that could cause injury or death to construction workers, that official will verbally notify the construction supervisor or foreman and the contractor about those hazards. The official will request abatement of those hazards by a given time. The IHS official will also notify the federal or tribal contracting officer and the contractor or builder in writing and request compliance with the health and safety provisions of the contract.

Imminent danger is a condition or practice such that it could be reasonable to expect these to cause death or serious physical harm immediately or before these conditions or practices can be eliminated through normal enforcement procedures. Where imminent danger exists the IHS official will request, through the federal or tribal contracting officer, that the contractor stop construction at the danger point and take immediate action to remedy the danger. The incident

should be documented including date, location, contract number, contractor, date and time of official notification, standard and regulation, recommended corrective action, and official signature.

The contractor's failure or refusal to comply with occupational safety and health standards and regulations following written notification will be cause for the contracting officer or tribe to issue a written order to the contractor to suspend all work on the contract. When the contractor corrects the safety deficiency to the satisfaction of the contracting officer or tribe, a written order to resume work will be issued by the contracting officer or tribe. It some cases it may be necessary to involve OSHA officials.

6.5.4 Construction Site Safety for the Community

A typical project site may have many attractive nuisances, defined as something that will attract the attention of onlookers. In coordination with the tribal officials the contractor or builder should take measures to keep children and onlookers out of and away from the construction site using necessary measures including barriers, signs, signals, flagmen, and public/community education.

Depending on scope and complexity of the project, a plan to formally notify the community about when and where future project related work will occur. Such plans must be developed cooperatively by the IHS staff and tribal personnel. The plan can also provide broad education to the public about upcoming and on-going project activities and any anticipated or scheduled impacts it may have during construction (i.e. temporary loss of water service).

The plan can be publically communicated through public meetings, posting information at the Post Office and at public buildings, announcing the information over the radio, or publishing it in the local paper.

If the project manager and tribe determine there are serious safety concerns or hazards that must be addressed, that portion of the project should be stopped until the safety concerns can be addressed. To do this, the matter should be immediately brought to the attention of the federal or tribal contracting officer. The contractor or builder should immediately be notified of the situation and directed to address the matter. The project manager, tribal officials, contracting officer, and contractor may need to cooperatively develop a plan to address the safety concern or hazard.

6.6 Construction Tracking

The level of effort required of the IHS project manager and staff will depend on the method of work and IHS role previously identified. In addition to simply administering the construction in accordance with the construction documents, the project manager must continually monitor and control the construction in order to ensure a successful project. Regardless of the method of work, these are the general activities required to adequately track the construction:

- Inspection
- Performance reporting

- Cost control
- Schedule control
- Scope control
- Quality control
- Changes
- Resource balancing
- Risk management

Changes to the cost, schedule, or specifications, and for all other significant issues that come up on a project are typically documented in some form of issue log. This includes a description of the issue, the stakeholders involved, and when and how the issue is resolved. The log ensures that all issues are resolved promptly, and that all parties involved are informed of the outcome. It also provides a record through the life of the project about what went right and what went wrong, so you don't have to remember everything that went on over the project lifespan (sometimes many years).

6.6.1 Submittals

Construction documents typically require that the contractor submit quality control documents and material and product information prior to installation on a project. The contractor or builder must also provide a schedule for submitting these documents that defines when the required submittals can be expected by the project manager. The schedule must include a practical arrangement for reviewing and processing the submittals long enough in advance for the material and product suppliers to deliver on time.

6.6.2 Submittal Reviews

It is imperative that the project manager or designee accurately document submittals and process them within contract-required timeframes. Late responses and unclear recommendations may become the bases for an engineer-caused delay claim by the contractor. Accurate recording of date submittal is received and returned is essential.

Similar submittal requirements are typically included in federal and tribal procurement contracts. Submittals may include any or all of the following:

- Progress schedule
- Product data
- Shop drawings
- Samples
- Design data
- Test reports
- Certificates
- Manufacturer's instructions
- Manufacturer's field reports
- Erection drawings
- Construction photographs
- Operation and maintenance manuals

All items identified in the submittals schedule will be submitted in accordance with the construction documents. The project manager will review the submittals and accept or reject using the submittal review form. Specific submission and review timeframes for submittals are outlined in the construction documents. The contractor is required to utilize the submittal review form with every submittal submission. Typically three sets of each submittal are provided. Each submittal submission and resubmission should be numbered consecutively. The contractor must sign and date the form. The project manager is typically allowed 15 days to respond with approval or rejection of the submittal.

6.6.3 Approval

The contractor will complete the sections for submittal number, contractor name, contract number, and description information on the submittal review form. The manufacturer's name and model number for each item of material or equipment must be listed. Supporting documentation (catalog cut sheet, product data, shop drawings, etc.) must be provided when the material submittal is not one of the exact brand names specified in the technical sections. The supporting documentation will be used by the project manager to compare the proposed submittal with the specified item.

The project manager in coordination with the federal or tribal contracting officer will date the submittal when it is received and then annotate either "Approved" or "Rejected". When rejected the specific reason(s) for rejection must be provided on the back of the form or on an attached sheet. The project manager shall sign and date his response and specify the date returned to the contractor. Copies of the submittal action must be provided to the federal or tribal contracting officer.

6.6.4 Quality Control and Inspection

Under most circumstances the IHS inspector or project manager will not direct work or communicate to a contractor or tribal force account except through the appropriate tribal official. When the method of work is federal force account or federal procurement construction, the IHS inspector or project manager will direct work and may communicate directly to a contractor or force account crew. The role and responsibility of the IHS inspector must be defined in the construction and project documents to avoid confusion and preclude inconsistent communications with the party executing the construction. The following discussion of quality control and inspection is intended to generally describe the work required to achieve high quality work that conforms to the construction documents. Nothing described in this section is intended to supersede the construction, project, or contract documents or the "Criteria for the Sanitation Facilities Construction Program".

The extent to which IHS can affect the quality of constructed facilities will depend significantly on the method of work and on the IHS role in the project. During the construction phase quality control is largely dependent on the amount of inspection. The IHS level of inspection can range from daily construction monitoring done on behalf of the tribe to very cursory monitoring and final acceptance at the conclusion of construction. Comprehensive construction inspection by

IHS is described below, although that level of inspection may not be required for all SFC projects.

The project manager will conduct inspections at times but will more often coordinate construction inspection with an IHS engineering technician or construction inspector. The goal of these inspections is not to direct the use of specific methods or construction equipment. Except when the method of work is federal force account, the IHS staff will not direct the work. For all other methods, the tribe or tribal officials will direct the work. The inspections can and should identify any obvious or demonstrated unsatisfactory or unsafe methods or equipment. These deficiencies will be called to the attention of the contractor.

The results and findings of all inspections will be documented by note or memo. Daily inspection logs must be maintained to document the daily progress of the work and all related issues in a complete and factual manner. Including a well-documented photo history of the project with dates and descriptions is crucial, especially because most sanitation facilities are buried prior to completion.

Inspections will be conducted with the builder and, in most cases, with a tribal representative. The project manager will be responsible for ensuring that all necessary reporting is completed in an accurate and timely manner. The project manager will provide construction inspection updates to the relevant federal and tribal officials. Inspector requests, comments, and responses will be given directly to the contractor or their superintendent or field manager and not to subcontractors, suppliers, or workers. Except when the method of work is federal force account, IHS staff will not direct the work and communications with the contractor will be made through the tribal representative. Any direct discussions with subcontractors or suppliers should be in the presence of the contractor's superintendent, unless specifically authorized by the general contractor.

Inspectors will reject non-approved materials or machinery as soon as they are recognized and before they are incorporated into the project. The project manager or inspector must document all rejections in the inspection and construction reports. Daily inspection log entries should state the daily progress of the work in a complete and factual manner.

Complete and accurate inspection reports and logs are critical. In the event of legal action or court proceedings inspection reports can be deposed and introduced as evidence. Inspection reports must be supplemented with special reports on accidents, tests, or problems involving the contractor. It is important that the inspections be clearly written and easily referenced. Many Area SFC programs have standardized inspection requirements.

A variety of testing may be required depending on the requirements in the construction documents and the specific facilities being constructed. The party responsible for the testing will be specified in the construction documents. It is critical that the results of all required testing be evaluated by the inspector or project manager and documented in the project manager's records.

6.6.5 Performance Reporting

Performance reporting provides information to stakeholders on status, progress and forecasting in the form of details on scope, schedule, cost and quality. Typically a periodic status report is prepared that describes the current state of the project related to schedule and budget. The detailed budget and schedule developed during the construction document phase will provide the basis for monitoring the construction performance.

When the work method is federal or tribal procurement, work completed relative to the schedule is the main focus in tracking performance. The cost of the facilities is specified in the contract and the contractor assumes the cost risk. If change orders to the contract are required the contract cost versus overall budget quickly becomes a focus of the project manager. If a project being constructed using a contract goes over schedule the IHS may incur added cost even when the contract allows for liquidated damages. As a result the schedule must be monitored closely and delays should be discussed promptly with the contractor.

Force account construction, whether federal or tribal, allows risk to be shared by the tribe and the IHS. When this work method is used both cost and schedule must be carefully monitored. Comparing daily worker time sheets, daily production reports, equipment costs and material costs with the estimated cost and schedule will help to define the extent to which the project is on time and within budget.

When the work method uses a 638 construction contract both cost and schedule must be carefully monitored. Using this type of contract does not normally require that the IHS project manager monitor daily activity to the extent necessary with force account construction, but because IHS and the tribe share risks for cost, careful monitoring must be maintained throughout. The IHS role is decided as part of the contract negotiation and will be defined in the project documents.

Getting accurate, timely data in a useful format is critical for construction monitoring. Commercial software, contractor submittals, excel spreadsheets, STARS, and Area specific programs like the job cost accounting system used in the Navajo Area can be invaluable for translating the data into useful performance monitoring data.

To promote increased efficiency in construction of sanitation facilities, to track actual construction costs, to compile some historic construction cost data, and to develop the project management skills of individual SFC employees, regular performance reporting is critical. Simply knowing a project is behind schedule and/or over budget will not solve problems. The project manager must be able to identify the reasons and implement solutions to remedy the problem.

6.6.6 Cost Control

There is almost always an interaction between cost and schedule control, but cost control can also significantly interact with scope change control and quality control. In SFC project management, cost control typically requires the project manager to be responsible for these key

activities. The project manager will do these tasks or be responsible for each of these to effectively control costs regardless of the method of work:

- Regularly analyze data and monitor expenditures and cost performance to identify and understand any variances (positive or negative)
- Identify and influence factors that create change to the cost
- Ensure changes are agreed upon and prevent incorrect, inappropriate and unauthorized changes from being included
- Manage cost changes when they occur and attempt to bring cost changes within accepted limits
- Ensure that all changes are documented
- Inform appropriate stakeholders of authorized cost changes

The project manager will document cost variance and action taken for future project reference.

6.6.7 Schedule Control

There is almost always an interaction between schedule and cost control. Normally shortening the construction schedule is acceptable and may even be advantageous, but extending the construction schedule almost always negatively impacts the overall construction cost. In SFC project management, schedule control typically requires the project manager to be responsible for these key activities. The project manager will do these tasks or be responsible for each of these to effectively control schedule regardless of the method of work:

- Identify and influence factors that create change especially when the impact is to extend the construction schedule
- Ensure changes are agreed upon and prevent incorrect, inappropriate and unauthorized changes from being included
- Regularly analyze data and monitor progress to identify and understand any variances to determine schedule changes
- Manage schedule changes when they occur
- Ensure that sure all changes are documented
- Inform appropriate stakeholders of authorized cost changes

When revising the schedule, the project manager may deem it necessary to develop a corrective action plan. Corrective action is meant to bring the future schedule back to or towards the original project schedule. Corrective action requires identifying the root cause of the delay, and implementing solutions. This can be done in a variety of ways including expediting other activities, and the project manager and construction superintendent or contractor will ideally develop the plan together.

The project manager will document schedule variance and action taken for future project reference. The lessons learned with respect to the cause of the variance or delay and any corrective actions chosen should be documented for future project reference.

When the method of work is based on federal or tribal procurement contract construction, the project manager will make recommendations to either the contracting office and/or the tribe on the appropriateness of extensions to the contract time. Any changes to the contract, including

cost or time changes, should always be documented through a formal change order as described in Section 6.6.10.

Generally the contractor or builder and contracting officer will be notified by the project manager if actual work differs by more than 2 weeks from the approved progress schedule. Late or accelerated actual progress may require a revised schedule. The review and approval process is the same as with the original schedules. In addition to revising the schedule, the project may warrant a corrective action plan. Corrective action is meant to bring the future schedule in line with or towards the original project schedule. Corrective action requires identifying the root cause of the delay, and implementing possible solutions.

6.6.8 Scope Control

The main objective of construction inspection is to determine that work in progress or completed work complies with technical requirements of the contract drawings and specifications for both Federal procurement and MOA tribal procurement. As representatives for both the SFC Program and tribe, field personnel must be fair, but firm, with the contractor in assuring compliance with drawings and technical specifications.

As potential changes in scope arise, the project manager must carefully assess the effect on the cost and schedules and communicate with the project stakeholders to ensure that their intents are satisfied.

6.6.9 Construction Report

The primary method to communicate during the construction phase is the construction report. All SFC projects must have a method of regular reporting. Construction reports are usually written weekly although the timeframe may vary according to Area practice or CO requirement. The project manager is responsible for preparing the report at the conclusion of each construction work week regardless of the method of work. Significant information will be extracted from the inspector's daily construction reports/log and synopsized in this report. This construction report serves as the record of progress and other significant events that occur during construction. It also provides the basis for approval of contractor progress payments when federal or tribal procurement is the method of work.

Should the inspector complete the report, the project manager must also endorse it prior to distribution. Construction reporting must begin the week the notice to proceed has been issued regardless of whether construction actually begins. Construction inspection and testing are important monitoring tools for quality control, scope control, cost control and schedule control and must be described in the construction report.

6.6.10 Construction Changes

When the method of work is tribal or federal procurement the contractor is bound to perform the work as defined by the construction documents. When the method of work is force account

work, the builder is also required to perform the work as defined by the construction documents. When it becomes clear at the site that a change is required on a project, the project manager must immediately contact the CO (federal contracting officer when FAR contracts are used or designated tribal official when tribal procurement contracts are used) and describe the proposed change. In general, a change order is issued under three conditions:

- When a modification to the price or costs is required
- When a modification to the time is required
- When a modification to the terms of the construction documents (contract documents, technical specifications, or drawings) is required

Only the CO has the authority to change the terms of the contract. The construction inspector, project manager, or district engineer do not have that authority. The project manager must not orally authorize any change in the scope of work or amount to be paid and may not communicate such change without the contracting officer's prior approval.

Change orders must reflect a fair and reasonable price or change in time. Rarely no cost change orders are issued to document mutually agreeable changes to the construction documents. Most modifications are bi-lateral, supplemental agreements between both parties. However, work in dispute must never be completed by the contractor without an approved change order. By doing so the contractor risks not being compensated for work done outside of the terms of the contract.

Depending on the procurement method, there are specific procedures to be followed with change orders and other contract modifications. The project manager must be familiar with the regulations pertaining to the construction in progress. The rules for changes must be defined in the construction documents. A change order is typically processed as follows:

1. The project manager determines that a change is required or the contractor identifies a need for a change. It is the responsibility of the CO to determine if contract should be modified to incorporate change. Together the project manager and the CO determine if there is adequate funding for the proposed change order and consult with the appropriate stakeholders that may need to approve the change. Close scrutiny is needed when evaluating a contractor requested change. Work considered by the contractor to be a change may be covered by the contract and the request is merely a method for the contractor to increase the contract price. Under FAR contracts, the project manager must provide the CO with a Request for Contract Modification, which describes the justification and provides suggested wording. The CO will then issue an Amendment of Solicitation/Modification of Contract (Standard Form SF30) to the contractor.
2. The project manager prepares a change order which should include the following as applicable:
   - Justification for the proposed change
   - Contractor submitted documents, proposals, and costs
   - Estimate for the change with breakdown of costs (required for increased or decreased work)
   - Specifications and/or drawings that clearly define the proposed change
   - Certification that funding is available (may require agency(s) approval), and
   - Evaluation of impact on contract performance time

3. After the project manager completes the change order, it should be provided to the CO for review (funding agency review may also be required). The CO will sign and then present the change order to the contractor for signature.

6.6.11 Resource Balancing

Personnel and equipment resources will be required throughout the construction phase to fulfill the IHS role. These resources will have been identified during the construction planning described in Section 6.3. After construction begins changes to the schedule, scope, and budget may require modifications to those initial plans. Careful tracking and resources allocation will be required to ensure that the needs of all projects that share the same resources are met. Depending on the complexity of their project portfolio, project managers may require project management tools like MS Project to manage resources across projects. Interactivity between MS Project and PDS was developed as part of the PMPro and is available to help balance the resources among the projects and update specific PDS projects simultaneously.

6.6.12 Risk Management

As construction progresses and changes made, a periodic review of the initial risk assessment may be required. The initial risk assessment is conducted during the construction planning and is described in Section 6.3. An example risk management checklist can be found in Appendix 5.

6.7 Payments

Payments from IHS can only be made when the funding is received into the IHS project account. The payment process is similar for the project manager regardless of the method of work. In general, the project manager will review pay requests assuring that the quantities and costs are correct and accurate. The recommendation for payment will be provided to the federal or tribal contracting officer as appropriate. Depending on the method of work, payments fall into these general categories:

- Payments to a tribe/tribal organization from IHS
- Payments to a contractor or supplier/vendor from a tribe/tribal organization
- Payments to a contractor or supplier/vendor from IHS

The project manager serves as the contracting officer's representative (COR) for federal contracts and typically as a technical advisor to tribal contracting officials when projects are completed using tribal procurement or tribal force accounts.

6.7.1 IHS Payments to a Tribe/Tribal Organization

Payments to a tribe related to SFC projects must comply with the project specific documents and the Indian Health Manual Part 5, Chapter 2 Memorandum of Agreement guideline. The tribe and the IHS must minimize the elapsed time between fund transfer from the IHS to the tribe and disbursement by the tribe.

The IHS may provide an advance prior to construction to purchase or rent equipment and materials to prepare for construction. This initial advance should be kept to the minimum necessary and shall not exceed 25 percent of the tribal project budget. Upon initiation of construction, the tribe may request additional funds consistent with the approved project budget, work accomplished, and cash flow schedule. Advances must be tied to scheduled expenditures and must minimize the time between transfer of funds and disbursement by the tribe, tribal organization, or contractor.

The project manager or other designated Area official will process tribal pay requests using a standard format. Individual Areas may have specific procedures, but generally the process will be as follows.

1. First time payments should include the ACH vendor form SF 3881 for electronic payment and a copy of the MOA. Subsequent payments do not require copies of these documents unless payments were based on MOA amendments.
2. The project manager completes a request for payment for:
   - ∞ An initial advance for project construction/administration consistent with the MOA policy based on a cash flow schedule. Advance payments will be scheduled to minimize the time between disbursement to the tribe and expenditure.
   - ∞ An advance for project construction/administration consistent with the MOA policy to cover costs the tribe is expected to incur over a specified time period (e.g. 60 days) in consideration of work accomplished and the cash flow schedule. Based on previous advances versus actual expenditures, adjustments may be made in the cash flow schedule.
   - ∞ Completed work with expenditures reviewed, verified, and recommended for payment by the project manager. Typically this request for payment is submitted with a contractor's application for payment, an invoice, or a report outlining the expenditures.
3. The request for payment is reviewed, signed and processed per Area specific policy.
4. For tribal force account work the tribe or tribal organization will submit a detailed report of actual construction expenditures at least once a month. Those expenditures will be reviewed, verified, and recommended for payment by the project manager
5. The request for payment is then forwarded to the appropriate Area finance department for processing.

6.7.2 Tribal Payments to a Contractor/Vendor

Depending on the specific agreements in project documents, the project manager may have a role as advisor or technical reviewer for the tribal contracting officer. IHS does not have a role in directing the payment from tribal accounts to contractors, suppliers, or vendors.

The number of partial pay requests that the contractor may submit is generally not limited. However, in order to reduce the administrative workload, contractors must be encouraged to submit a monthly partial pay request. The contractor should use the payment request form provided in the construction documents for both partial and final payments. Contractor supplied forms that provide adequate information can be approved for use by the tribe and the IHS.

Individual Areas may have specific procedures and the arrangement of specific projects may vary, but generally the process will be as follows:

1. The contractor and project manager agree on completed quantities and amounts in the field for the proposed payment.
2. The contractor then submits the payment request to the project manager and a copy to the tribal contracting officer.
3. The project manager will review the payment request within 10 days of receipt. The project manager will compare the unit prices shown on the invoice against those in the contract and verify the quantities claimed for payment against the construction logs, the mathematical calculations for each item, and the amount to be retained.
4. Upon agreement with the invoiced amount, the project manager will approve the payment request by signature, date, and payment amount and recommend payment to the tribal contracting officer.
5. The project manager will deliver the recommendation for payment to the tribe by hand delivery, fax, or mail.
6. Generally, the tribe will make payment to contractor immediately provided they have the funds available from IHS contribution or other funding source.

6.7.3 IHS Payments to a Contractor/Vendor (FAR)

Direct payments from IHS to contractors, suppliers, or vendors are governed by the Federal Acquisition Regulation (FAR). For FAR contracts and purchases the project manager typically serves as the contracting officer's representative (COR). Payment request forms are provided by the contracting officer and are typically included in the construction documents.

The number of progress or material payment requests that a contractor may submit is not limited. However, in order to reduce the administrative workload, contractors should be encouraged to submit a payment request monthly. The contractor must include the following information on invoices:

- Contract number and contractor name
- Nature of payment, partial or final
- Dates of period covered by the invoice
- Partial payment number when applicable
- Itemized charges, bid schedule item number, item description, and quantity invoiced
- Unit price as shown on the contract and price extension (Quantity x Unit Price for each item billed)
- Total cost of work invoiced
- Payment for materials on hand (if applicable)
- Deduction for pre-paid materials installed (if applicable)
- Proposed retainage (specified in construction documents)
- Total amount requested
- Signature of contractor or his representative
- Concurrence line for COR signature

Every payment request must be date stamped by the COR upon receipt. The COR must promptly process all payment requests. Due to the Prompt Payment Act the Government is

required to pay interest on late/overdue payments to Contractors and these payments are made automatically through finance and charged to individual projects.

Upon receipt of an incomplete or improper payment request, the COR shall promptly reject it. In that case payment shall be returned to the Contractor with appropriate documentation identifying why it was rejected.

Individual Areas may have specific procedures and the arrangement of specific projects may vary, but generally the process for IHS payments directly to contractors, vendors, and suppliers will be as follows:

1. The project manager will verify the quantities claimed for payment against IHS records of the work actually performed. This information will be recorded in the COR's log.
2. Ensure that the unit costs shown on the pay request correlate with the unit costs for the awarded contract and any subsequent modifications.
3. Check the mathematical calculations for each item claimed for payment.
4. Partial payments may be adjusted by the COR (red pen and initialed). Adjustments to final payment request require that the contractor concurs with these changes. The date the changes are agreed upon should be noted on the request. This date will serve as the prompt payment date.
5. The COR will recommend the retainage amount to the contracting officer who will make the final determination.
6. Materials payment may be approved for materials delivered to the job site. Material invoices must accompany the pay request and these materials must be inspected by the COR or construction inspector to ensure that the materials are in accordance with the contract specifications prior to recommending payment. Additionally, no materials payment shall be made for materials for which a required submittal has not been received and approved. Materials that have been prepaid for must be deducted from the unit price when the Contractor bills for installation. The Contractor remains responsible for safeguarding and protecting these materials. The Government assumes no liability for protecting the materials, although IHS should strive to ensure that the Government's interests are protected.
7. Payment requests are typically routed as follows although individual Area may have alternative procedures.
    - ∞ Contractor: Submits to project manager (COR)
    - ∞ Project manager (COR): Stamps receipt date, verifies quantities, checks math and previous payments, recommends withholding, signs, and forwards acceptable invoice and memo to the district engineer (where applicable) or to the contracting officer
    - ∞ District engineer: Reviews payment, adjusts withholding amount (if appropriate), checks math and previous payments, and forwards to contracting officer
    - ∞ Contracting officer: Reviews, signs, approves payment, tracks payment, forwards to finance office
    - ∞ Finance: Finance office processes payment from Treasury to the contractor

6.7.4 Materials

The process to pay for materials will depend on the method of work. In general, payment can be made for materials delivered to the site. The material must represent a major cost element, such as delivery of a pre-fabricated pump house. The project manager must verify that the quantity and type of material billed for complies with construction documents and has actually been delivered to the work site. The contractor/builder must provide material invoices with their payment request. No payment shall be made for materials that do not have an approved submittal on file. Title of the materials remains with the contractor until final acceptance of project. It is therefore, the contractor's responsibility to safeguard on site material.

6.7.5 Retainage

Retainage and the payment for retainage must be described in the construction documents, usually in the contract agreement and general conditions. Typically, retainage is set at 5 to 10 percent. The amount retained is paid to the contractor with the final payment.

6.7.6 Liquidated Damages

Liquidated damages are designed to prevent financial harm to the IHS or to the tribe for whom a project is being constructed if a project is not completed on time. They are not intended to be a punitive measure, but only to reflect damage incurred as a result of the late completion. In general, liquidated damages can be assessed if a contractor has not completed the work under the contract within the specified contract times and the owner has experienced an associated "damage".

The project manager has the responsibility to thoroughly review information and provide recommendations to the federal or tribal contracting officer if late completion occurs. Delays may or may not be in the control of the contractor or builder of a project. Ideally the contractor will diligently complete the work within the specified contract times, but delays do occur that are beyond the contractor's control. When that occurs, a formal change orders must be executed in a timely manner to extend the contract time.

The project manager will evaluate a contractor's failure to complete work within the performance period and determine if it is due to circumstances beyond the control of the contractor. Pending that determination, the project manager will recommend to the federal or tribal contracting officer whether liquidated damages should be imposed. The contracting officer will make the final determination about liquidated damages.

Liquidated damages must be described in the construction documents to account for potential damages resulting from delay. This might include additional travel and inspection services, lack of revenue from the system (water service fees), or costs incurred while the system is being completed (payment of temporary/emergency toilet facilities). Typically payment of liquidated damages is made by withholding sufficient funds from the final payment request and retainage to cover the amount of the liquidated damages.

6.8 Construction Completion

The project manager's responsibilities during construction completion will be to conduct and coordinate the pre-final inspection to make certain the work described in the construction documents has been fully completed and that the work constructed and O&M services rendered (for example O&M training, O&M manual development, as-built surveys, etc.) complies with technical requirements of the contract drawings and specifications. Typically, these activities take place during the completion of construction:

- Pre-final inspection, pre-final inspection punch list and correction of all items noted
- Final inspection final inspection punch list and punch list completion
- Acceptance of the work and final payment
- Warranty of the work

When a project manager conducts a thorough pre-final inspection and the builder completes any punch list items, the final inspection may largely be a formality which highlights the excellent work of the project team.

The construction completion activities described in this section will largely depend on the method of work and the IHS role defined for a specific project. The description of construction completion activities that follow should be considered "typical" and are not intended to supersede Area policies, the requirements of the construction documents, tribal requirements, or the SFC Criteria for the Sanitation Facilities Construction Program.

6.8.1 Pre-Final Inspection

When the contractor or builder considers the entire work complete, written notice to the tribe or federal contracting office and the project manager will be provided. Typically a pre-final inspection will be scheduled to verify that the facilities are complete in accordance with the construction documents. The project manager, inspector, a representative of the contractor or force account crew, and other participants as appropriate will conduct the pre-final inspection. In most cases a punch list of items to be completed or corrected will be developed a list before the final inspection and final payment. The contractor is required to correct all deficiencies by the contract completion date.

The participants on a pre-final inspection will typically be the following:

- Contractor or contractor's representative or force account superintendent depending on the method of work
- IHS project manager and project engineer if they are not the same person
- IHS district engineer
- IHS engineering technician, inspector, or other responsible person depending on the IHS role in quality control
- Tribal operator or representative
- State or county inspectors as appropriate

Typically, the pre-final inspection will be held after start up of the constructed work and will include a review of the entire work including start up and any required start up training.

Occasionally components of a project that constructs multiple facilities constructed over a long time period may be inspected separately.

The project manager and tribe may issue a certificate of substantial completion accompanied by a punch list of remaining items following the inspection when the method of work is tribal procurement. Clauses related to substantial completion must be included in the general conditions of the construction documents.

6.8.2 Final Inspection

A final inspection must be conducted on all completed sanitation facilities construction projects prior to acceptance and final payment. A final inspection may be conducted on a project component that is completed and scheduled for transfer or beneficial before the completed project is inspected.

The following participants will typically take part in a final inspection:

- Contractor or contractor's representative or force account superintendent depending on the method of work
- Representative of the tribal O&M entity that will operate the constructed facilities
- Tribal operator or representative
- IHS project manager and project engineer if they are not the same person
- IHS engineering technician, inspector, or other responsible person depending on the IHS role in quality control
- IHS O&M utility consultant
- IHS district engineer
- The director of the IHS Sanitation Facilities Construction program
- Federal contracting officer or tribal contracting officer when the method of work is federal or tribal procurement respectively
- Representative of any other funding agencies that contributed to the construction
- State, county, or other local officials as appropriate

The final inspection must be conducted before the contract completion date and after the construction is complete. The project manager will typically coordinate with the contractor or force account superintendent to schedule the final inspection after all items identified in the pre-final inspection punch list are complete.

The project manager will prepare a written punch list of deficiencies noted during the final inspection. As part of the inspection all required post-construction submittals will be reviewed, including as-built/record drawings, O&M manual, and test reports. Written notification will be provided to the contractor/builder with a copy to the tribal or federal contracting officer. All deficiencies must be corrected on or before the contract completion date and before final payment is made. When the method of work is force account construction the builder will also correct all deficiencies in accordance with the construction schedule, but will not be subject to the contract completion date.

The project manager must prepare and distribute the final inspection memo that should include the following information:

- The date of final inspection and a list of participants
- A list of actions taken for any punch list item previously provided to the contractor
- The final inspection punch list and a clear statement of the date of completion

Individual IHS Area policy or local utility practice may require that a beneficial use agreement be executed. Beneficial use is a legal term describing right of a party to enjoy the benefits of specific property even though title to that property is held by another party. Components of a project may be completed and put into use before the entire project is complete. In such cases beneficial use may be in the interest of the IHS and the tribe. Consideration must be given to the responsibilities for safety, access, utilities, and insurance during the period of time between beneficial use and final completion. Clauses related to beneficial use must be included in the general conditions of the construction documents.

6.8.3 Acceptance and Final Payment

The project manager must certify completion and accept the work constructed. The specific details of this will vary depending on the method of work. All items listed on the punch-list will be complete prior to the final acceptance. Typically a certification of punch list completion (CPLC) or affidavit of punch list completion (APLC) is used to document the actions taken to address the punch list items. The APLC or CPLC is normally written in memorandum form with references to each item number of the punch-list and brief notes on how each item was addressed. For items that required a specific action, simply stating "Done" will be sufficient. For items that allow alternative actions, ask a question or require explanation, a brief explanation of the completed action will be required.

Once all of the work is complete and the requirements of the construction documents are met, the project manager can accept the work and approve the final payment request. In addition to the usual payment certifications, the contractor must include a statement that all of the contractual work is complete and that payment of the final request will release the government from any claims associated with the work.

6.8.4 Warranty

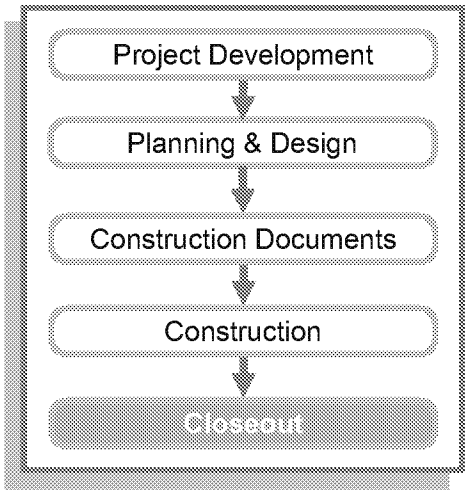
Generally, a contractor shall warrant the work for a one-year period. The warranty period may begin on the date of final acceptance or from time of beneficial use. Other local events like substantial completion may be specified as the beginning of the warranty period. Clauses related to warranty must be included in the construction documents and will be determined by the method of work. In addition to triggering the start of warranty periods, beneficial use can also place the O&M responsibilities on the party using the facilities.

It is critical to communicate the exact warranty period to all the stakeholders to ensure a common expectation and that a warranty inspection will be held toward the end of the warranty period, usually at 11 months. Section 7.10 describes the warranty inspection. Making this widely known

when the construction is complete and establishing the warranty inspection date will be helpful to all stakeholders.

7.0 THE CLOSEOUT PHASE

7.1 Introduction



The closeout phase begins once the project is accepted by the owner. Historically, any work associated with operator training, O&M manuals, as-built surveying and record or composite drawings, ordinance and fee structure development, and project warranty was considered project closeout activities. This may still be the case for some projects, but under PMPro project managers are expected to evaluate and address O&M considerations and costs throughout the five project phases. This will help to mitigate risks associated with the long term operation and maintenance of completed facilities by the tribe or individual owner and help ensure the sustainability of the newly constructed infrastructure.

In many instances, O&M related activities must be initiated prior to or concurrent with construction to ensure that tribal utility departments are adequately prepared to finance, operate, and maintain completed facilities. As an example, operator training for operation of an advanced Sequencing Batch Reactor (wastewater) or arsenic removal (water) plant upon completion of construction would be far too late to ensure a reasonable chance of successful and sustained operation. This phase and the project are considered complete with the publication of the final report. Publishing the final report also changes the project status from active to inactive in PDS.

Closeout activities include tasks to put the new facilities into operation, transfer the facilities to the tribe or individuals, and complete the final project documents. The specific closeout activities depend on the method of work. As applicable, the following items will be completed during the Closeout Phase if they were not completed in previous project phases:

- Record (as-built) drawings
- Composite drawings
- Operation and maintenance (O&M) manual
- Operation and maintenance (O&M) training
- Asset inventory
- Interagency agreement closeout
- Warranty inspection and repair
- Transfer, individual, or beneficial use agreement
- Project financial reconciliation
- Final report

Transfer and beneficial use agreements may not be necessary if these are defined in the project MOA or when a tribe constructs facilities using Title 1 or Title 5 agreements. In these cases, a notice of project completion usually takes the place of a transfer agreement.

7.2 Work Package

An individual project may have an established work breakdown structure (WBS) that defines the discrete work elements for the entire project. A WBS is a results-oriented tree that captures all work of a project in an organized way. An example can be found in Appendix 2. This may be shown graphically or as a list of "element" categories and tasks similar to those on a Gantt chart schedule. An individual work package, or branch of the WBS tree, is one project phase. Creating a WBS may be helpful to clarify the work elements in the closeout phase if one has not been established.

7.3 As-Built Survey

The process for completing an as-built survey will vary depending on the project type and the method of work. The project manager will be responsible for the completion of the as-built survey. Requirements to provide an as-built survey must be included in the construction documents for projects constructed using federal or tribal procurement. The as-built survey will normally be provided by IHS or tribal staff when projects are constructed using force account labor as the method of work. The party responsible to provide the as-built survey must be identified in the project documents unless this will be completed through the construction documents. Data collection beyond the initial as-built survey may be necessary to ensure all appropriate as-built data is collected for accurate and complete record (as-built) drawings.

7.4 Record (As-Built) Drawings

Record drawings use information from the as-built survey and marked-up construction drawings provided by the contractor or construction supervisor to provide a record of the actual facilities constructed. The project manager and all project staff are responsible for ensuring that record drawings comply with IHS or area policies and guidelines current at the time of their development.

At a minimum, the tribe and system operator must receive copies of the record drawings immediately after the completion of projects that construct community facilities. Individual homeowners must receive copies of the record drawings immediately after the completion of projects that construct community facilities. The IHS Area, district, or field office responsible for the construction project must also maintain both printed and AutoCAD versions of the record drawings to ease the development of future designs, for O&M reference, and to ease facility upgrading in the future.

7.5 Composite Drawings (Comprehensive System Drawings)

Composite drawings create a single record representing all water and sanitation facilities existing in a given community. The availability of accurate and current composite drawings is crucial to improve the effectiveness and efficiency of future systems analysis, assets inventory, O&M planning, onsite system troubleshooting, community planning, and sanitation facilities design. In order to maintain accurate and current drawings, composites shall be updated as water and sanitation facilities are built and improved in conjunction with the development of any

construction as-built drawings. For communities where no composite drawings exist, an SFC project may provide an ideal mechanism to create the drawings and record as-built data.

At a minimum, composite drawings must be scalable, geo-referenced, and include basic infrastructure details. Composite drawings will ideally include component identifications and specifications, installation dates, sizing information, materials of construction, road names, house and building identification, and important community features. A separate inventory that includes the geographical coordinates and component description may also be useful and can be included in the composite drawings effort. Infrastructure features that may require geographical coordinates include any buried feature that may require quick locating, for example valve boxes, septic and water tanks, overflows, cleanouts, important buried pipe locations (bends, sections known to fail, etc.), and sewer manholes.

When delivered as part of the construction projects, the requirements to provide composite drawings must be included in the construction documents. Because composite drawings are critical to a successful IHS O&M Program, updating these drawings must be coordinated with the Area or District O&M staff.

Some Areas have begun using a Geographical Information System (GIS) to manage their composite drawings. Although not currently in wide use, a large majority of respondents to a 2010 survey indicated enthusiasm for GIS as a valuable tool for both project planning and management of composite utility drawings. The benefits of a comprehensive GIS for tribal planning efforts that include utilities, water resources, and land status and land management have become widely acknowledged. Engineers and project managers are encouraged to evaluate the benefits of incorporating a GIS database into the composite utility drawing efforts.

7.6 Operations and Maintenance (O&M) Manual

A complete O&M manual for constructed facilities is crucial to effective management of newly constructed faculties. To be complete, the O&M manual must fully detail all system components and the O&M requirements of each. The project manager is responsible for the complete O&M manual, but the method of work will determine who develops the manual. The party responsible to provide the content for the O&M manual must be identified in the project or construction documents.

When the method of work is federal or tribal procurement, the requirements to provide the O&M manual are typically included in the construction documents. When the method of work is force account construction, the project manager or project engineer must develop the O&M manual in coordination with the Area O&M consultant. For maximum effect, the completed O&M manual must be complete and available during O&M training.

7.7 O&M Training

IHS tribal operators and managers must know how their water, wastewater, and solid waste system components operate and how to keep them in working order. An operator's ability to

effectively and reliably operate and maintain community systems over the long-term is crucial in protecting public health and the environment, and ensuring customer needs are fulfilled.

When the method of work is federal or tribal procurement, O&M training is typically part of the contract requirements and provided by the contractor or equipment vendor. For best results, O&M training should be provided within the contract period and utilize the O&M manual. When the method of work is force account construction, the IHS will typically provide O&M training and this must be coordinated through the IHS O&M Program. The project manager will be responsible to determine the extent to which ongoing O&M training will be required and this too must be coordinated through the IHS O&M Program.

7.8 Asset Inventories

Tribal utility organizations and governing bodies must have sufficient knowledge about the value and complexity of their utility assets to make informed decisions about the management of their water and sanitation infrastructure. Asset inventories are one of the fundamental tools used to provide that knowledge. They are often are required by audit standards. Asset information must be provided to the facility owner once projects are completed. At a minimum, the asset inventory must include identification of items, item description, brand, make and model, installed date, expected life, installed cost, and a comment on condition. The asset inventory provides both current and replacement values and a basis for preventive maintenance and manpower planning.

When the method of work is federal or tribal procurement, the requirements to provide the asset inventory are typically included in the construction documents. When the method of work is force account construction, the project manager or project engineer will typically develop the asset inventory in coordination with the Area O&M consultant.

7.9 Interagency Agreement (IA) Close-out

Agreements with partner agencies are relatively common for SFC projects, usually to accept financial contributions into IHS projects. The process to close out these agreements is typically included in the agreement and most often requires a final report and financial reconciliation. All IA requirements must be identified at the time the agreement is signed prior to construction so that the IHS project manager can ensure the terms are met at the appropriate project phase and to standards of the partner agency.

7.10 Warranty Inspection and Repair

The IHS provides a one-year warranty period for all completed projects. The warranty period typically starts on the "beneficial use" date. When there is no beneficial use agreement, the certification of punch list completion or affidavit of punch list completion date will initiate the warranty period. These punch list documents are described in Section 6.8. Near the end of the warranty period, typically 11 months after it begins, the project manager and owner of the constructed facilities will make an inspection to determine if warrantable items remain. If no

such items are identified during the warranty inspection, or after any such items are corrected, the warranty period will end.

The method of work will determine the responsible parties and warranty process. When the method of work is federal or tribal procurement, the contractor shall warrant the work for a one year period from the date of substantial completion or beneficial use. Additionally, some equipment may have a longer manufacturer's warranty although that typically does not include the labor of removing, installing or replacing the equipment on site. The construction documents must describe the warranty process and responsibilities. Tribal leaders and system operators must be aware of all warranty periods for their equipment as part of the transfer process. When the method of work is force account construction, Area policies and guidelines will define the procedure to repair failed system components during the warranty period.

After receiving notification of a potential warranty item, the project manager will determine the legitimacy of the warranty request. If the problem is not directly attributable to faulty design, materials, or workmanship, then the IHS may not be responsible for repair costs nor associated liability. Warranty items associated with design flaws should be shall be discussed with the District Engineer and the system operator prior to implementing solutions.

The following will generally not be considered warranty items:

- Willful and/or negligent acts of third parties including vandalism and careless acts. An example of a careless act is car damage to a meter or fire hydrant.
- Normal maintenance problems like clogged sewer lines and the replacement of supplies or equipment that are exhausted or worn out in a normal life span.
- Problems due to operator/owner negligence including negligent acts of commission and omission by operating entity or owner personnel and/or their representatives. Acts of commission are things like bypassing control safety circuits. Acts of omission are things like neglecting to investigate 300 pump starts over a week's period or allowing plumbing to freeze.
- Uncontrollable acts, including damage due to random, catastrophic natural occurrences like major floods or a direct lightning strike that cannot be feasibly predicted and/or prevented by design.

It is essential to consider the IHS mission to raise the health status of the American Indian and Alaska Native people through increased and improved access to water and sanitation infrastructure when investigating failed facilities during or after the warranty period. Providing technical assistance and O&M support may be desirable even if failed or deteriorated facilities or other issues are not covered by a construction project warranty.

7.11 Transfer Agreement Overview

A project is completed when all rights, title, and interest of the United States ends in accordance with the Memorandum of Agreement (MOA) provisions. A transfer agreement is the formal document assigning ownership of the completed facilities to the receiving owner. The method of work and local requirements will determine the specific content of the transfer agreement. Typically a transfer agreement will be used when the method of work is federal procurement and

a project completion notice will be used when the method of work is tribal procurement. Individual IHS Areas may have specific procedures to transfer completed facilities. The "Criteria for the Sanitation Facilities Construction Program" includes transfer instructions and contains an example of a transfer agreement. A draft transfer agreement may have been developed during the construction documents phase to make closeout more efficient and facilitate a quick update, review, and processing.

7.11.1 Transfer Agreement (Under Direct Service)

Upon completion of construction, the punch list, and operator training for facility operation and maintenance, all right, title, and interest of the United States shall be transferred to the tribe in accordance with the provision of the MOA. All facilities, materials, supplies, and equipment constructed or purchased under IHS contract and provided in accordance with an MOA shall be transferred to the appropriate MOA party during closeout. Transfer must occur prior to any sustained use of the facilities, typically no more than 30 days unless a beneficial use agreement is in place.

Sanitation facilities may also be transferred from the IHS to a tribe, to non-Indian cities or towns, to public authorities (e.g. water, sanitation, or improvement districts operating under State law), and to nonprofit organizations serving American Indians or Alaska Natives.

When developing a transfer agreement, the project manager must include the following items:

- A sufficient description of all major facilities being transferred.
- A list of minor items such as vehicles and specialized equipment including property identification numbers and transfer documents required by any established property management guidelines.
- As-built drawings and O&M manuals or a specific reasonable date by which these materials will be furnished.
- A description of the one-year warranty for latent defects in materials and workmanship as described in Section 7.10.

7.11.2 Individual Agreements (Under Direct Service)

Individual agreements are required for each individual home served when IHS provides direct service. Requirements for individual agreements are established in Chapter 8 of the "Criteria for the Sanitation Facilities Construction Program". After the project MOA is signed, the homeowner or their representative must sign an Individual Agreement which allows the IHS to enter their property to install the agreed upon sanitation facilities. When the construction is complete the homeowner must sign the agreement again. The individual agreement documents the facilities constructed and transfers the facilities to the homeowner.

7.11.3 Partial Transfer Agreement (Under Direct Service)

A partial transfer agreement may be used when useable facilities, personnel training, record drawings, and O&M manuals are all completed before other project provisions are complete.

The requirements for a transfer agreement described above must be used for a partial transfer agreement.

7.11.4 Project Completion Notice

A formal transfer agreement is not required when none of the constructed facilities provided in accordance with an MOA were procured by IHS. It is essential that all parties be notified and, if possible, concur that the project has been completed. Project completion notification is generally used for tribal procurement or for projects completed by other entities utilizing IHS funds.

The notification is a letter of from the IHS Area Director to the appropriate parties indicating the date of project completion and requesting the appropriate official to sign the letter indicating concurrence. In the event of disagreement, the response can be a return letter to the IHS Area Director within a specified number of days of any reason the project should not be considered complete. The letter of notification should not indicate that the facilities are or were the property of the United States. However, transfer of all rights, title, and interest of the United States in such facilities is appropriate.

7.12 Financial Reconciliation

Project financial accounts must be reconciled after all activities in the project scope have been completed. Detailed financial reconciliation for each funding agency will be required and any contributed funds that remain shall be reported and returned. Typically, any remaining IHS funds will be returned to the IHS Bulk Account. Financial reconciliation, including final activity in UFMS, will be complete prior to publishing the final report.

7.13 Final Report

A final report must be prepared and published for each sanitation facilities project within 12 months of the project transfer date. For contemporary projects with complete PDS records, the draft final report can be generated using the "Final Report" button on the details page of the PDS project record.

The final report serves two purposes. It supplements the official file with information regarding the technical and legal execution of the project. It also provides a descriptive summary of the work undertaken and completed.

At a minimum, the final report shall include the following information in appropriate detail:

- Explanation of any differences between the proposed facilities and facilities provided, including differences in the number of homes served.
- Sources and amounts of all project funding including the disposition of unused funds.
- Project expenditures detailed by the type of expenditure and/or expenditures by type of facility provided.
- Description and listing of facilities installed including quantities (e.g. feet of pipe by size, numbers of water service lines, etc.).
- List of homeowners and addresses of homes served by the project, if available.

- Copies of official documents, including, at a minimum, the project proposal document, the Project Summary, Memorandum of Agreement (MOA), Project Summary amendments, MOA amendments, MOA, and transfer documents.

The Area SFC Program Director must approve and sign all final reports. Once approved, the final report, including appendices, must be converted into a Portable Document Format (PDF) file. The PDF file must then be attached to the associated PDS project in the STARS data system. The syntax for final report files is "FR-AreaProjectNo.pdf" (e.g. FR-OK05P39.pdf) to facilitate ease of future data queries. When the final report is uploaded to PDS, the Area SFC Director must enter the completion date in the "Actual" column of the PDS "Final Report Published" milestone (4999). An actual date in this milestone will automatically toggle the project status for the reported project from "Active" to "Inactive"

7.14 Customer Service Surveys

Public Law 86-121 mandates consultation with and encourages the participation of the Indian tribes served by the SFC Program. Understanding customer and partner satisfaction with and perceptions of the SFC program is critical to effective management decisions.

By locating field staff on or near reservations and working with communities and homeowners through the SDS process, project planning, and design consultation, customer service is inherently built into SFC program. The SFC staff interacts with various parties, many of whom are IHS *customers*, to gain input throughout the execution of sanitation projects. Funding partners, typically other federal agencies, are also customers in that SFC projects help them to fulfill of their specific missions. To help understand the perceptions of IHS customers, the SFC Program has developed a standardized practice to measure customer satisfaction.

To assist in the collection of customer satisfaction data, five standard survey tools were created and approved by OMB. The survey tools, instructions, analysis, and reports are being incorporated into STARS. The specific survey will be dictated by the type of project and participants involved. The standard survey tools are:

- Tribal Homeowner Survey
- Tribal Partner Survey
- Agency Partner Survey
- Post Construction O&M Survey
- Annual Operator O&M Survey

These survey tools can be found in the STARS library under the HQ Area, category "Tools", and the sub-category "General".

For maximum effectiveness each completed project must be followed up with customer service surveys. Goals for percentages of homeowners to be surveyed may be set by specific Areas but ideally at least 60% of all homeowners that receive service from the SFC program will be surveyed. All projects that provide community facilities will be followed by a tribal Partner Survey, Agency Partner Survey when applicable, and a Post Construction O&M Survey. Ideally

all tribal O&M organizations will be surveyed annually using the Annual Operator O&M Survey.

The Division of Sanitation Facilities Construction Customer Service Guidance Document describes the customer service program in detail.

7.15 Closeout

Recognizing Success

Completing construction is a significant event for many projects. This may an ideal time to recognize the contributions of the various project team members, tribal partners, other funding agencies, and contractors or constructors who built the facilities. Thank-you letters and award recommendations are ideal ways to recognize people and will improve morale overall. Communicating the successful completion of projects to our tribal partners with activities such as putting notices in tribal newsletters, letters of appreciation to the Councils, etc. may enhance future relationships.

Lessons Learned

If the final report does not include a synopsis of the lessons learned over the course of the project, the project manager may require a closeout summary that documents these before archiving the project files. This summary provides a record of what went right and wrong, all of the issues that developed and how they were addressed, and contains a checklist to ensure that all of the closeout activities were taken care of.

The SFC program in most Areas has historically lacked a formal process to archive historical project knowledge. The result of that is that a great deal of knowledge about how things work best is lost when project managers and engineers transfer. Formally recording the lessons learned will help avoid repeating common mistakes.

7.16 Project Files

The Area Office will be the repository for original, signed project documents. The IHS record management policy is detailed in the Indian Health Manual, Part 5, Chapter 15, Records Management Program. The disposition of project documents is described in IHS Records Disposition Schedule 3, Section 11, Item No. 11-9 which provides guidance about transferring them to a Federal Records Center. For maximum efficiency, copies of project documents must be uploaded into STARS as attachments to individual projects.

Homeowner files start with the application for service by the homeowner and are maintained through the closeout phases. The Home Inventory Tracking System (HITS) module of STARS is used to track applications for sanitation facilities provided to individuals and specific home sites. Project information related to the sanitation facilities constructed at an individual site is documented in the project files and attached to HITS. Typically individual records will include

the following information at a minimum. Copies must be included in the packet of materials provided to the homeowner.

- Individual Agreement Form.
- Well data, including location, depth, diameter, type, and length of casing. Information on perforations or screens, gravel packs, grouting. Formations encountered and developed. Test pump data and bacteriological and water quality analyses results.
- Pumps installed, including date of installation, depth, size, make, model, serial number, and warranty.
- Waste disposal information, including location tied to permanent markers, type, size, and manufacturer of septic tank and drain field materials. Also, design data, percolation test results, length and depth of lines, etc.
- Documentation of training and operation manuals provided to homeowner.
- Record of all home visits and purpose of visit.
- As-built drawings with permanent ties for the facilities installed.

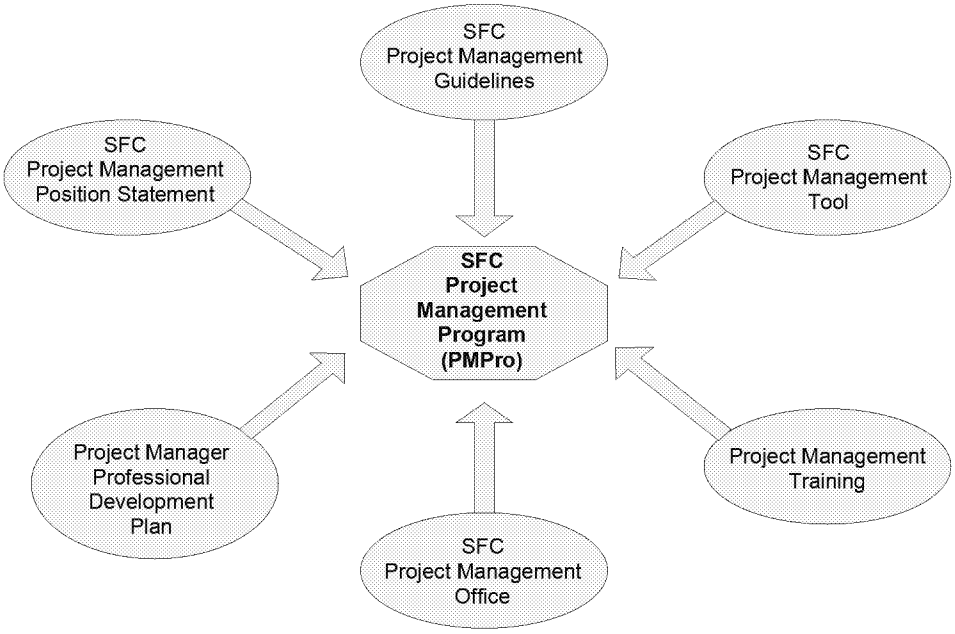
APPENDIX 1

OVERVIEW OF THE SFC PROJECT MANAGEMENT PROGRAM (PMPro)

The SFC Project Management Program (PMPro)

The SFC Project Management Program (PMPro) is a multifaceted approach to making formal project management part of the SFC organizational fabric. PMPro has been through pilot trials and will be fully deployed when this guidance is completed. PMPro will continue to improve and evolve as program growth and experience dictate. It consists of the six major components depicted below. The goal of PMPro is to facilitate implementation of project management best practices and support individual project manager development. An explanation of each of these components is presented below.

Figure 1.1 The SFC Project Management Program (PMPro)



The SFC Project Management Position Statement

Projects are the vehicle the SFC program relies upon to accomplish its mission. Project management success is directly linked to SFC program success. To underscore the importance of project management, the SFC program has adopted the following position statement.

> *Proactive project management is fundamental to our culture and accomplishing the IHS mission. Project management has always been inherent in our service delivery. Formally implementing a Project Management Program is essential to continued success. We embrace "best practices" for project management that will improve our service to our customers. Through this commitment, the SFC program will become known as an exemplary project management organization.*

This position statement will serve as the guidepost for the SFC Project Management Program and its various elements.

The SFC Project Management Guidelines

This working draft document describes the role of project management and project managers in SFC. It also defines SFC project phases and makes recommendations on how to apply project management knowledge toward the effective management of SFC projects.

This guideline is a tool to help apply the Project Management Body of Knowledge (PMBOK) compiled by the Project Management Institute (PMI) to the management of SFC projects. PMBOK is divided into the following project management knowledge areas:

- Scope
- Time
- Cost
- Quality
- Human Resources
- Communications
- Risk
- Procurement

Further detail on each of these knowledge areas is presented in Appendix 2. In addition, these concepts are critically integrated into the various SFC project phases that are presented in subsequent chapters.

A thorough elaboration of the PMBOK concepts is beyond the scope of these guidelines; SFC project managers who wish to immerse themselves in these concepts (and perhaps seek the Project Management Professional certification) are highly encouraged to seek out the wide range of external courses available on these topics.

The SFC Project Management Tool

The SFC Project Management Tool (PM Tool) is envisioned as an electronic means of managing not only individual projects but also portfolios ("portfolio" being defined as multiple projects at various stages of completion). Currently, SFC project managers are using a wide range of methods for project and portfolio management, ranging from simple "back of the napkin" approaches to Microsoft® Excel spreadsheets and Microsoft® Project templates.

The basic foundation of the PM Tool is the SFC PDS system. While PDS was primarily designed as a reporting tool, the system also offers basic project management features. For those types of projects and operations which do not require advanced project and portfolio management capabilities, PDS is an effective tool. It is also worth noting that, regardless of the type of project management tool to be used, the project schedule and milestone reporting input of PDS will remain a requirement for SFC project managers.

The next level of complexity for project management can require the following:

- Identification of specific individual project tasks that are unique to each project

- The ability to estimate and integrate timing estimates for each task
- The ability to map out task dependencies and critical paths
- The ability to manage resource needs
- The ability to establish and track milestones independent of the PDS milestones
- The ability to manage multiple projects

The most likely candidate to supply this additional functionality is Microsoft® Project (Enterprise version). This software is the most widely used project management software and is already in use by a number of SFC project managers. In addition, research conducted by the VE#9 team indicates that at least two IHS Areas (Navajo and California) have already established templates in MS Project.

The implementation of the PM Tool (PDS and Microsoft® Project) is intended to be introduced at the District level. Accordingly, participating District engineers will serve as the initial point of data input. This keeps the task burden off the shoulders of the field engineer and assures a strong communication line between the field and district. At some point afterwards, that responsibility can shift to the field engineer where appropriate for the situation.

SFC Project Management Training

A key component of the SFC PMPro will be training on the various elements of the program, including the guidelines, the PM Tool, SFC best practices, etc. This training will be conducted internally on both an informal and formal basis.

Informal training (which has been the primary historical means of disseminating project management practice in SFC) will consist of on-the-job-training, mentoring, and adopting practices and tools already in place at a particular work location (i.e., a Field or District Office).

Formal training, on the other hand, might occur during entry-level staff orientation, at Mid-Level Managers meetings, or as specially-designed courses that focus in one or more of the PMPro elements. For instance, it is likely that some form of internal course will be developed to educate SFC personnel on these guidelines as well as the PM Tool.

Outside or "external" project management training is considered part of the project management development element and is discussed in Section 1.7.

The SFC Project Management Office

The SFC Project Management Office (PMO) is ultimately envisioned as a virtual Center for Project Excellence that consists of a core group of SFC subject matter experts in the discipline of project management. This core group would be available to provide not only technical assistance and advice for SFC project managers but would also be responsible for continuing to develop the SFC PMPro via the following means:

- Continuing to improve and add features to the PM Tool
- Designing and coordinating basic and advanced PM training courses

- Developing an electronic library of PM best practices and successful PM cases studies
- Refining the PM career development path
- Providing PM consultation and training to other IHS Programs
- Continuing to refine and update the PM Guidelines document
- Track and report on overall project performance trends
- Administer a project management excellence awards program

In essence, the eventual success and organizational traction of the PMPro would rest on the shoulders of the individuals supporting the SFC PMO.

The SFC Project Manager Development Plan

Career development in project management is similar to the engineering field. Both include a mix of formal training, education, on the job experience, and practice. Continual project management skill development is as important to the SFC project manager, if not more so, than engineering skill development. As a project management organization, it is incumbent upon SFC to encourage and reward skill development and advancement in the project management field.

As part of an overall development approach, an SFC project manager should focus on technical and engineering training and educational opportunities during the early years of their career. But, as responsibilities grow, it is beneficial to enrich this engineering skill and knowledge with an increasing amount of project management related training and education.

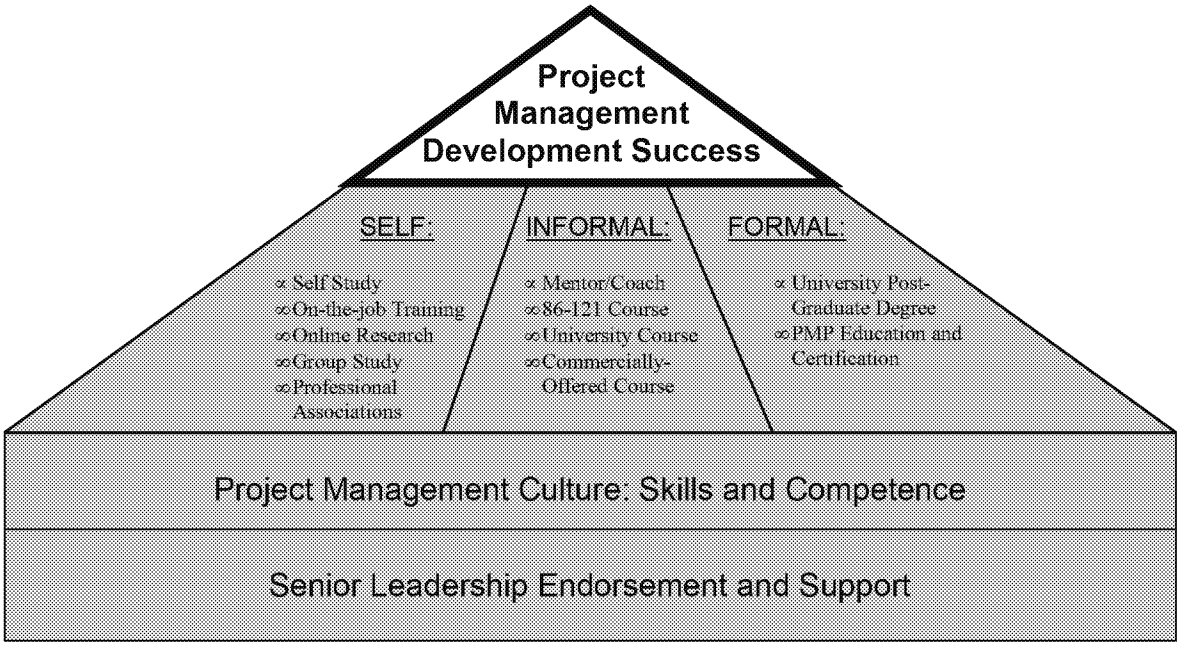
There are several training opportunities that help develop project management skills. Many focus on so called "soft" skills, those skills that are necessary to effectively work with large groups of people. Given the large number of project stakeholders in a typical SFC project, the importance of these soft skills in the SFC world cannot be overstated. Examples of project management related training include:

- Conflict Resolution
- Time Management
- Group Facilitation
- PMBOK Training
- Communication
- Management/Leadership
- Technical Writing

The illustration below depicts another view of project management development and the importance of self-study, informal, and formal training in order to develop into the most effective project manager. More importantly, it illustrates how critical senior leadership support and the organizational culture are to project management development success. An individual project manager cannot be optimally successful unless the leadership and culture are aligned in support of project management.

A future career development team will further articulate the Project Management Development Plan. Action items for this team include establishing individual training targets and position descriptions that clearly articulate project management responsibilities, developing and proposing a separate project management career path, identifying and/or creating mentorship opportunities, and identifying relevant external project management training opportunities.

Project Manager Success Factors



APPENDIX 2

PROJECT MANAGEMENT CONCEPTS

Project Management Concepts

This appendix provides a basic overview of project management basics as well as the SFC project phases. These concepts should be treated as the foundation of any SFC project manager's knowledge.

Basic Definitions

The following is a discussion of basic project management definitions and concepts. SFC project managers are highly encouraged to continually expand their knowledge of the project management field through training and education.

Project

A **project** is a temporary endeavor that is comprised of a sequence of connected activities. It is undertaken to create a unique product or service. In the SFC world, projects are typically undertaken to provide sanitation facilities for federally recognized American Indians and Alaskan Natives. It is through the completion of projects that SFC supports the Indian Health Service mission of raising the health status of American Indians and Alaskan Natives to the highest possible level. Given the direct link between SFC project success and SFC mission accomplishment, the SFC program must be the best project management organization possible.

Project Management

Formal project management (hereinafter referred to as project management or PM) is the application of principles, skills, tools, and techniques for the purpose of defining, planning, executing, controlling, and completing a project. Not unlike the professional engineering environment, the practice of project management has its own body of requisite knowledge, skill sets, credentials, and advanced educational opportunities.

Project Manager

The **project manager** is the person assigned to carry out a project. An effective project manager applies the broad field of project management to specific project needs. The field of project management can be defined as a complimentary set of core competencies. These include:

Project Manager Core Competencies

The following competencies should be considered a as a foundation for the SFC project manager. Obtaining and strengthening these competencies can and should be considered as part of any project manager's career development plan.

Knowledge

PM Knowledge is the total knowledge comprised within the project management field. Experience and training are two primary sources of this knowledge. Another source widely recognized by the industry is the **Project Management Body of Knowledge (PMBOK®)**

Project Manager Core Competencies

Knowledge	Skills	Attributes
PM Knowledge	Organizational	Flexible
Knowledge of internal and external SFC environment.	Time Management	Adaptable
Technical	Interpersonal	Collaborative
	Communication (written and verbal)	Proactive
	Problem Solving	Resourceful
	Leadership	Effective
	Conflict Resolution	

While most of the terms used in the table above are self-explanatory, a few are worthy of special discussion as described below.

compiled by the **Project Management Institute (PMI®).** As described in the publication, the PMBOK puts forth a subset of project management knowledge that is generally recognized as best management practice. It is also adopted as a project management standard by the American National Standard Institute (ANSI). SFC project managers are encouraged to become fluent with the PMBOK. There are multiple training opportunities available to acquire this knowledge and PMI offers a Project Management Professional certification as a benchmark for demonstrating project management knowledge.

Knowledge of the **Internal SFC Environment** is a good solid understanding of how the program internally conducts business. Essentially, it is the knowledge needed to "make things happen." A primary source of this knowledge is the Criteria for the Sanitation Facilities Construction Program. Area-specific guidelines and policies are other good sources. An ability to get things done within an organization is essential to the success of a project manager.

Knowledge of the **External SFC Environment** is a good solid understanding of our project partners or **stakeholders**. Knowledge of how tribes conduct business, tribal infrastructure problems, potential funding agencies, local market conditions, and regulations that impact SFC projects are examples of things that form the external environment. An SFC project manager must be resourceful in expanding their knowledge of the external environment. Several Areas have developed work practices and standards designed to improve interactions with the external SFC environment. Effective project managers understand the external environment and are able to navigate it to complete their assigned projects and develop new projects to address other deficiencies.

Skills

There are several training opportunities that help develop project management skills. Many focus on so called "soft" skills, those skills that are necessary to effectively work with large groups of people. Given the large number of project stakeholders in a typical SFC project, the importance of these soft skills in the SFC world cannot be overstated. Examples of project management related training include:

- Conflict Resolution
- Group Facilitation
- Communication
- Technical Writing
- Time Management
- PMBOK Training
- Management/Leadership

Project Management Core Concepts

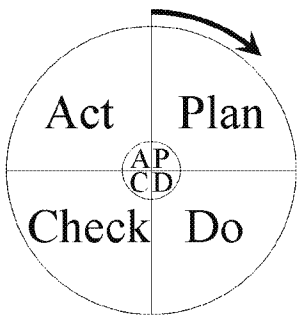
Project Life Cycle/Phases

Project managers use **Project Phases** to break a project into manageable pieces. It is a useful strategy to "keep from getting ahead of yourself." The end of a project phase is typically marked by the completion and acceptance of a major deliverable. Also, the end of each phase includes a decision point on whether to proceed onto the next phase. These decision points, or **gates,** are points along the project path that may only be passed when certain conditions are met. A thorough review of these phases and gates as they apply to SFC projects is provided in Chapter 3 of these guidelines.

The PDCA Cycle

Another essential project management concept can be illustrated by the **Plan-Do-Check-Act cycle (PMBOK, pg. 39)** from the field of quality management.

The Plan-Do-Check-Act Cycle



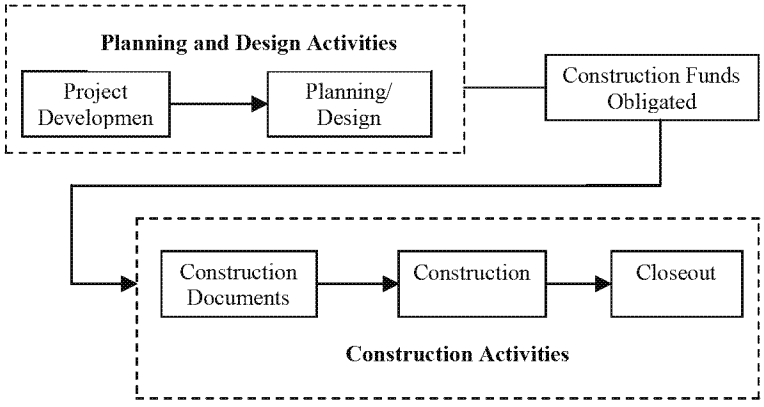
The concept illustrates a basic and effective project management approach:

- Plan what to do.
- Do what was planned.
- Check what was done.

- ∞ Act appropriately, i.e., accept the work product or make changes.
- ∞ Repeat.

The plan-do-check-act cycle is at work in the SFC project phases. It is especially clear when you consider a traditional SFC project to be two distinct sets of activities. The first are planning and design activities and the second are construction activities. The outcome of the first set of activities provides a plan to complete the second. The illustration below shows the five SFC project phases divided into these two sets of activities.

The Two Distinct Types of SFC Activities



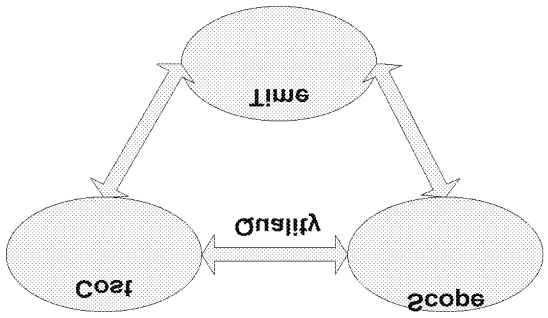
The project development phase initiates the cycle by creating a *plan* for accomplishing project planning and design. During the planning/design phase, the plan is executed, this is the *do*. At the end of the planning/design phase, the work products are reviewed, or *checked*. Based on the results of this review, an *act*ion is taken. Ideally, it would be to begin planning the construction project. The action may also be to refine the planning and design work until specific project requirements are met. In either event, the cycle will continue to repeat as the project incrementally moves forward. The cycle continues even after a project is completed and closed out. For example, experiences and lessons learned in the closeout of a project (i.e., the final check) should be brought forward and considered when planning a new project.

In reality, project management is more complex than the Plan-Do-Check-Act Cycle. For example, it is more effective to have a series of checks or reviews occur while the work is being completed, instead of after it is all done. This provides a higher degree of assurance that when the work is completed it will meet project requirements. An example of this in the SFC world is contract document reviews. Typically, the documents are reviewed at two or three points during their development, not in one large review at the end. Still, the cycle illustrates a simple and effective approach to managing a project.

Triple Constraints

Another fundamental project management concept is the **triple constraint of time, scope, and cost.** Project managers must understand the interconnectivity between these items, and also their potential impact on project quality. Increasing or decreasing any one constraint will cause a shift in the others; this dynamic relationship is presented below.

The Triple Constraints of a Project



For example, if the scope of the project is increased, it will most likely increase the cost and the time to complete the project. This may also positively or negatively impact project quality.

Work Breakdown Structure

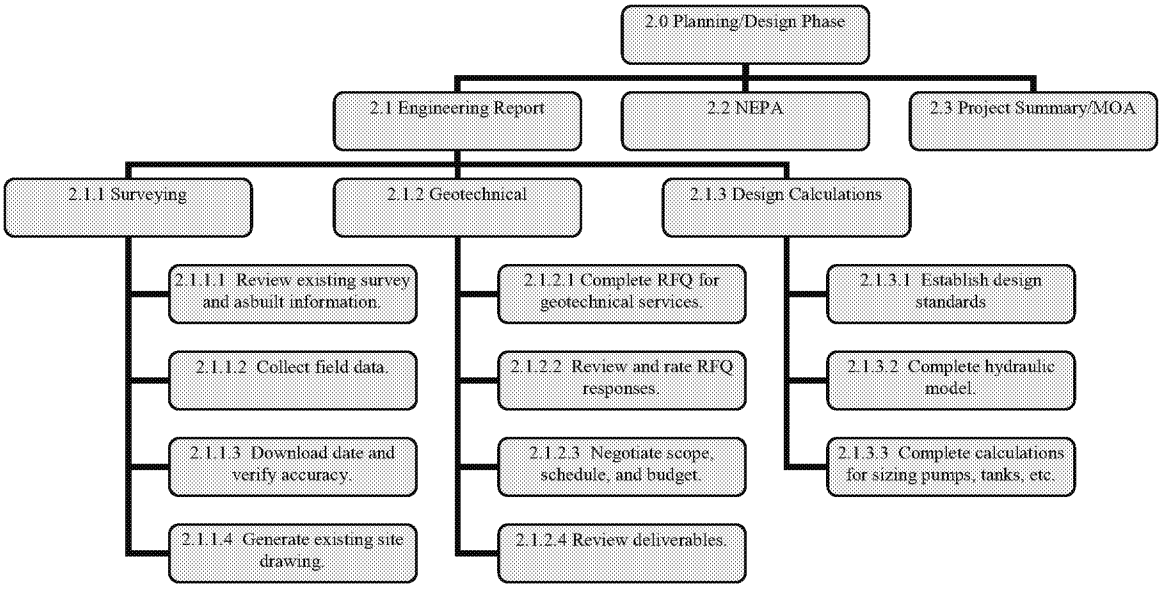
A **work breakdown structure (WBS)** is an effective project management tool used to plan work, allocate resources, and develop schedules. A WBS is the breakdown of a project phase into manageable individual work packages. These individual work packages can be easily assigned and their durations estimated. Development of a WBS is a project planning activity.

Completing a WBS allows the project manager to clearly identify required tasks, determine their sequence, make work assignments, estimate task durations, and estimate task costs. Once the WBS is completed, the project manager is well positioned to articulate a clear scope of work, schedule, and budget. These are essential elements of the project development plan.

Below is a simple example that illustrates how a WBS can be used to plan the necessary tasks that need to be completed during the Planning/Design Phase.

The following example illustrates how a project phase can be broken into a level of detail where tasks and activities are easily identifiable and defined. Each successive lower level provides a higher degree of detail.

- Level 1 – Project Phase
- Level 2 – Major Deliverables
- Level 3 – Major Tasks
- Level 4 – Specific Activities



In the partially completed example, the project manager has identified three major deliverables, an engineering report, a NEPA review, and a Project Summary and MOA package. Focusing in on the engineering report, the project manager determined that surveying, a geotechnical evaluation, and design calculations as three major tasks. The manager then broke each major task into a list of activities that can be assigned and scheduled. The same breakdown of tasks and activities can be done for any number of major deliverables following the same approach. In this example, that should happen for the NEPA review and the Project Summary/MOA.

As with most project management tools, it is up to project managers to determine the appropriate level of detail that is useful for a specific project. But, as tasks are broken down into tasks and/or individual activities, it becomes easier to assign individuals and determine durations. A WBS is an extremely useful tool for developing a complete scope of work and realistic project schedules.

The PMBOK Knowledge Areas

The Project Management Institute (PMI) has developed a document called *A Guide to the Project Management Body of Knowledge (PMBOK)* through a consensus standards development process. Through this process, professional and practicing project managers published proven traditional practices that are widely applied in the profession. The PMBOK asserts that a project management team utilizes up to 44 project management process to manage a project. It further organizes those 44 processes into nine Knowledge Areas

The nine PMBOK Knowledge Areas are listed below. SFC project managers should develop proficiency in each.

Scope Management

Project scope management is the process by which we ensure that the project includes all of the necessary work required to complete the project successfully. The management of the project scope is based on first defining the scope of the project and then managing the project to ensure that that scope is carried out. Scope planning is the process by which a **project** scope

management plan is created. Essentially, we are planning the scope of work that will accomplish the goals of the project (i.e. address the deficiency). Create a project scope management plan that documents how the project scope will be defined, verified, controlled, and how the work breakdown structure will be created and defined.

Time Management

Managing time is a critical element to ensure that projects are completed in a timely manner. Of the triple constraints, the SFC program has traditionally placed the least amount of emphasis on time. However, timely project completion is now an Office of Management and Budget (OMB) measurement of how efficient and effective the SFC program is operated. In addition, time is directly related to cost and resources needed to complete a project. While the SFC program is and always will be run differently than a private consulting firm, it is essential that emphasis is placed on time management to complete projects in an efficient manner for a myriad of program-related reasons and incentives.

Cost Management

Project cost management is the process by which we plan, estimate, budget, and control costs so that a project is completed within the project budget. When planning for cost management, it is important to incorporate all of the cost resources necessary to complete project activities (both internal and external). See the Procurement Management section of this chapter for items that may be included in cost management.

Quality Management

The Indian Health Service takes great pride in providing high quality sanitation facilities to Indian Communities. In order to continue this practice, we must think about the ways that quality can be not only maintained but continuously improved on our projects.

Human Resource Management

Human resource management describes the activities necessary to assemble, organize, and manage the project team. It is important to consider and identify human resource requirements early in the project development phase. The project will have a higher probability of success if the project manager includes as many of the team resources in the project development phase as is prudent. Each of the project team members will be responsible for completing tasks throughout the project to ensure its ultimate success.

Communications Management

Communication during any project is essential to its success. Project managers should determine who to communicate with during the project (i.e. who are the stakeholders), when to communicate with each stakeholder, and what information must be communicated to each stakeholder. Communicating information to stakeholders throughout the project will minimize confusion and misunderstanding that may be detrimental to the project.

Risk Management

Risk is defined as an uncertain event or condition that, if it occurs, has a positive or negative effect on the project objectives (time, cost, scope, or quality). Due to the nature of our projects, the SFC program has to become effective at managing risks that are inherent in the work that we

do, so that we can plan for risks and deal with them in a proactive manner…"no surprises." Performing effective risk management within the SFC program will have the following results:

- ∞ Increased likelihood that the project is completed within budget
- ∞ Increased likelihood that the project is completed on time
- ∞ Decreased likelihood of "scope creep"
- ∞ Increased likelihood that the final product is of high quality

For successful risk management, project managers must identify all of the possible risks for a given project (Known Risks) and decide whether or not to plan for them (Responsive/Proactive) or not plan for them (Unresponsive/Reactive). To maximize the probability of project success, project managers should try to be proactive and plan for as many known and unknown risks as possible.

Procurement Management

Many SFC projects, depending on size and complexity, will require the procurement of outside services in order to complete the development, planning, design, and construction phases of a project. Procurement management represents a deliberate and informed approach to identifying, obtaining, and managing the wide range of services that may be required by a project. Included in the concept of procurement management is also the proactive involvement of procuring entities (e.g., contracting officers). These entities are essential to procurement management with regards to preparing scopes of work, requests for proposals, the bidding process, contract documents, and monitoring these contracts.

APPENDIX 3

CONCEPTUAL PROJECT COST ESTIMATE

TEMPLATE

IHS SDS Cost Estimate (Developed by Phoenix Area, 4/2012)

Project Name: _____

Date: _____

Schedule A: Project Planning & Design (Project Development Plan Based)

Item	Description	Quantity	Units	Units Cost	Total
1	Surveying		LS	$	$
2	Composite Utility Mapping/CAD/GIS		LS	$	$
3	Hydraulic Analysis		LS	$	$
4	Geotechnical Investigation		LS	$	$
5	Hydrogeologic Study		LS	$	$
6	Archeology Survey/Monitoring		LS	$	$
7	Endangered Species Surveys/Monitoring		LS	$	$
8	Floodplain Analysis		LS	$	$
9	Utility Evaluation (Operations & Budget Capacity, Compliance)		LS	$	$
10	Other		LS	$	$
				Planning & Design Total:	**$**

Schedule B: Construction

Item	Description	Quantity	Units	Units Cost	Total
1			LS	$	$
2			LS	$	$
3			LS	$	$
				Construction Total:	**$**

Schedule C: Post Construction

Item	Description	Quantity	Units	Units Cost	Total
1	1-Year Start-Up Assistance (Mechanical Systems Only)		DAYS	$	$
2	Operator Training		DAYS	$	$
3	O&M Materials and Equipment (Project Related)		LS	$	$
4	O&M Manual Development		LS	$	$
5	Surveying: (As-Built)		LS	$	$
6	Computer Aided Drafting (As-Built)		LS	$	$
7	Other		LS	$	$
				Post Construction Total:	**$**

Planning & Design Total (Schedule A)		$
Construction Total (Schedule B)		$
Post Construction Total (Schedule C)		$
Schedules A+B+C		**$**
Contingency (Schedules A, B, & C)		$
Subtotal		**$**

10% Fixed Rate

Tribal Fees:

TERO/Tribal Tax	%	$
Tribal Procurement 1=YES, 0=NO		
Tribal Administrative Support Fee		$
Subtotal Tribal Fees		**$**

Varies by Tribe

Professional Fees:

Outside Engineering (A&E) or IHS Project Supported Engineer Design Services	$
IHS Engineering Program Support (EPS)	$
Subtotal Professional Fees	**$**

8% Fixed Rate *

6% Fixed Rate *

IHS Fees:

IHS Project Technical Support Fee	$
Subtotal IHS Fees	**$**

10% Fixed Rate *

Total Project Cost	**$**
Rounded Total Cost	**$**
Number of homes served	
Number of tribal homes	
Number of eligible homes served	
Unit cost (eligible homes)	**$**

* Fees may be removed or adjusted at project summary stage dependent on degree of internal/external design and inspection and funding source. For example, for an IHS funded project when IHS completes design in-house with program staff, the A&E fee (8%) and EPS fee (6%) would be eliminated at the Project Summary/MOA stage.

APPENDIX 4

CONCEPTUAL PROJECT COST ESTIMATE

EXAMPLE

SDS Calendar Year 2011 Cost Estimate Template

Project Name: Timbisha Water Main Replacement

Date: June 23, 2011

Schedule A: Project Planning & Design (Project Development Plan Based)

Item	Description	Quantity	Units	Units Cost	Total
1	Surveying	1	LS	$2,000.00	$2,000.00
2	Composite Utility Mapping/CAD/GIS		LS	$	$
3	Hydraulic Analysis		LS	$	$
4	Geotechnical Investigation		LS	$	$
5	Hydrogeologic Study		LS	$	$
6	Archeology Survey/Monitoring		LS	$	$
7	Endangered Species Surveys/Monitoring		LS	$	$
8	Floodplain Analysis		LS	$	$
9	Utility Evaluation (Operations & Budget Capacity, Compliance)		LS	$	$
10	Other		LS	$	$
				Planning & Design Total:	**$ 2,000.00**

Schedule B: Construction

Item	Description	Quantity	Units	Units Cost	Total
1	Water Main Replacement	1	LS	$250,600	$250,600
2			LS	$	$
3			LS	$	$
				Construction Total:	**$250,600**

Schedule C: Post Construction

Item	Description	Quantity	Units	Units Cost	Total
1	1-Year Start-Up Assistance (Mechanical Systems Only)		DAYS	$ 500.00	$ 500.00
2	Operator Training		DAYS	$	$
3	O&M Materials and Equipment (Project Related)		LS	$	$
4	O&M Manual Development		LS	$	$
5	Surveying: (As-Built)		LS	$ 500.00	$ 500.00
6	Computer Aided Drafting (As-Built)		LS	$ 500.00	$ 500.00
7	Other		LS	$	$
				Post Construction Total:	**$1,500.00**

Planning & Design Total (Schedule A)	$ 2,000.00	
Construction Total (Schedule B)	$ 250,600.00	
Post Construction Total (Schedule C)	$ 1,500.00	
Schedules A+B+C	**$ 254,100.00**	
Contingency (Schedules A, B, & C)	$ 25,410.00	10% Fixed Rate
Subtotal	**$ 279,510.00**	

Tribal Fees:

TERO/Tribal Tax	0%	$	Varies by Tribe
Tribal Procurement 1=YES, 0=NO	1		
Tribal Administrative Support Fee		$ 7,840.20	
Subtotal Tribal Fees		**$ 7,840.20**	

Professional Fees:

Outside Engineering (A&E) or IHS Project Supported Engineer Design Services	$ 22,360.80	8% Fixed Rate *
IHS Engineering Program Support (EPS)	$ 16,770.60	6% Fixed Rate *
Subtotal Professional Fees	**$ 39,131.40**	

IHS Fees:

IHS Project Technical Support Fee	$ 27,951.00	10% Fixed Rate *
Subtotal IHS Fees	**$ 27,951.00**	

Total Project Cost	**$ 354,432.60**
Rounded Total Cost	**$ 354,000.00**
Number of homes served	27
Number of tribal homes	27
Number of eligible homes served	27
Unit cost (eligible homes)	**$ 13,111.11**

* Fees may be removed or adjusted at project summary stage dependent on degree of internal/external design and inspection and funding source. For example, for an IHS funded project when IHS completes design in-house with program staff, the A&E fee (8%) and EPS fee (6%) would be eliminated at the Project Summary/MOA stage.

Item	Description	Quantity	Unit	Unit Cost	Total Cost
1	Water main (6" PVC)	4,000	LF	$50.00	$200,000.00
2	Fire Hydrants	3	EA	$3,800.00	$11,400.00
3	Gate Valves (6")	5	EA	$2,200.00	$11,000.00
4	Connection to existing Main	3	EA	$5,000.00	$15,000.00
5	Service re-connections and PRV	6	EA	$2,200.00	$13,200.00
	Subtotal				$250,600.00

APPENDIX 5

RISK MANAGEMENT CHECKLIST

EXAMPLES

Project Risk Management Form

Division of Sanitation Facilities Construction
Office of Environmental Health and Engineering
California Area Indian Health Service
Sacramento, California

1. General Information			
A. Project manager		B. Date	

2. Project Information			
A. tribe/Band			
B. Community name or location			
C. SDS Project Number			
D. Description of existing deficiency or problem			
E. Description of proposed facilities or solution			
F. Cost estimate		G. Potential Funding Agency	EPA-DWTSA
H. O&M capacity for proposed facilities			
I. Significant changes to O&M and impacts on existing facilities			
J. Is a feasibility study/preliminary engineer report recommended due to project complexity?	☐ Yes	☐ No	
K. Is a feasibility study/preliminary engineer report required by potential funding agency?	☐ Yes	☐ No	
L. If yes, who would complete the feasibility study/preliminary engineering report	IHS		

3. Planning		
A. Is there an initial alignment/location of the proposed facilities?	☐ Yes	☐ No
B. Is survey and/or aerial data available?	☐ Yes	☐ No
C. Would additional surveying be required?	☐ Yes	☐ No
D. Are permits required for the operation/connection of the proposed facilities?	☐ Yes	☐ No
E. If yes, specify the permits required		

4. Environmental		
A. Is there significant biological considerations?	☐ Yes	☐ No
B. Is there significant cultural property considerations?	☐ Yes	☐ No
C. Are the proposed facilities in a floodplain?	☐ Yes	☐ No
D. Is the Environmental Review and Documentation Form completed?	☐ Yes	☐ No
E. Does the environmental sensitivity of the proposed project warrant conducting biological and cultural surveys at this time?	☐ Yes	☐ No
F. Is an EA likely to be required due to environmental concerns?	☐ Yes	☐ No
G. Is an EA likely to be required due to funding agency requirements?	☐ Yes	☐ No
H. If yes, who would complete the EA?	A/E	

5. Rights-Of-Way		
A. Initial indication of land status	Tribal trust	
B. BIA permit required?	☐ Yes	☐ No
C. CalTrans permit required?	☐ Yes	☐ No
D. County permit required?	☐ Yes	☐ No

6. Design		
A. Method of procurement	MOA tribal procurement	
B. Are drawings attached?	☐ Yes	☐ No
C. Hydraulic analysis required?	☐ Yes	☐ No
D. Geotechnical investigations required?	☐ Yes	☐ No
E. Hydrogeological study required?	☐ Yes	☐ No
F. Pilot study required?	☐ Yes	☐ No
G. Electrical power extension required?	☐ Yes	☐ No
H. Design permits required (EPA, State, or County)?	☐ Yes	☐ No
I. If yes, list permits		
J. Have alternatives been considered?	☐ Yes	☐ No
K. If yes, list alternatives with brief description of each		

7. Project Resources		
A. Would IHS complete the pre-design and design?	☐ Yes	☐ No
B. Would an A/E be required?	☐ Yes	☐ No
C. Is there a critical project schedule?	☐ Yes	☐ No
D. If yes, provide comments (environmental, health threat, funding agency etc.)		

8. Project Reconnaissance Rating Index							
Project construction cost	Millions	$0.1	$0.3	$0.5	$1	$3	$4
	Points	☐ 1	☐ 2	☐ 3	☐ 4	☐ 8	☐ 9
Number of separate design contracts/packages	Number	1	2	3	4	5	6
	Points	☐ 1	☐ 2	☐ 4	☐ 6	☐ 8	☐ 10
Engineering disciplines [1]	Number	1	2	3	4	5	6
	Points	☐ 1	☐ 2	☐ 3	☐ 5	☐ 6	☐ 6
Type of project [2]	Level	Routine		Extensive		Unusual	
	Points	☐ 0	☐ 2	☐ 4	☐ 6	☐ 8	☐ 10
Potential environmental considerations/concerns [3]	Level	Low		Medium		High	
	Points	☐ 0	☐ 2	☐ 4	☐ 6	☐ 8	☐ 10
Design complexity [4]	Level	Routine		Extensive		Intricate	
	Points	☐ 0	☐ 2	☐ 4	☐ 6	☐ 8	☐ 10
Total rating index score							
Score ≤ 30	Proposed project appears routine. It is likely that current resources will be sufficient to complete the project. Project should be developed with normal/standard schedule and cost estimate for similar facilities.						
Score ≥ 30	Proposed project appears extensive and complex. It is highly likely that addition resources (IHS and/or outside A/E firm) will be required to complete the project. Project should be developed with considerations to longer schedule and higher cost estimate.						

1: Civil, structural, mechanical, electrical, instrumentation, architectural

2: Routine = water main extension; Extensive = pumphouse w/controls; Unusual = Uranium treatment/removal

3: Low = no EA; Medium = requires EA; High = requires EA and mitigation measures

4: Routine = water main; Extensive = pumphouse w/controls; Intricate = surface water or mechanical wastewater treatment

EXAMPLE SFC RISK MANAGEMENT QUESTIONNAIRE

Use this questionnaire to help identify potential project risks and as a basis for risk management planning.

Project Name

Item	Questions	Yes/No
1.	Is the need for the project well documented?	
2.	Is the proposed solution feasible – technically economically politically schedule environmentally	
3.	Are any agreements, permits, easements or other supplemental agreements required?	
4.	Have any environmental issues that impact the project or regulatory needs been identified?	
5.	Have funding parties been identified and funds committed?	
6.	Who are the shareholders and what is their interest?	
7.	Does the tribal council approve of the project?	
8.	Will the project be completed within 3 years of funding approval?	
9.	Who will own, operate and maintain the completed project?	
10.	Does this organization currently have capacity to own, O&M the completed project?	
11.	Has IHS designed and/or built a similar system in this area?	
12.	Is the cost estimate within 20% of expected construction cost?	
13.	Have all regulatory requirements been identified and plans to address developed?	
14.	Have planning and design processes been outlined and included in scope? (soils, A/E, surveys, drafting, plan/spec. drafting)	
15.	Has the procurement method been identified and evaluated?	
16.	Do all project stakeholders have essentially equal levels of risk in the project?	
17.	Is the public profile of the project high?	

18.	Does the plan include a communication plan to keep project stakeholders adequately informed?	
19.	Does IHS have in-house resources and capacity to adequately support the project?	
20.	Have alternative solutions been identified and evaluated?	
21.	Has project development included public notification and involvement?	
22.	Have construction market conditions been identified and evaluated?	
23.	Have contingency plans been developed for any likely risk to completing the project?	
24.	Is there substantial agreement among stakeholders on the scope, cost, schedule, quality and risks associated with this project?	

APPENDIX 6

SUMMARY OF METHODS OF WORK

The methods of work are briefly described below. The Indian Health Manual, Part 5, Chapter 2 which includes the SFC Program MOA Guidelines describes all of these methods in detail.

Direct Provision by the IHS

This method of accomplishing work includes Federal contracts with tribes or others and force account where the work is done by Federal workers.

Direct Federal Procurement

Federal contracts are used to construct the facilities and those contracts are regulated by the Federal Acquisition Regulation (FAR). The construction documents will include drawings, technical specifications, draft Transfer Agreement, Engineer's Estimate and a FAR contract package. In most Areas the IHS Contracting Office provides all bidding and contracting documents. The sanitation facilities procured by IHS with a contract belong to the Federal Government are transferred to an AI/AN community or other responsible non-Federal entity upon project completion.

- ∞ Direct Federal Contract.
- ∞ Public Law 93-638 Title I Construction Contracts. The P.L. 93-638 construction contract requirements are outlined in the IHS "Public Law 93-638 Construction Technical Assistance Guide" and in 25 CFR 900 Subpart J.

Government Force Account

In general, force account refers to work done without prior contractual agreement, and the cost of labor, materials, equipment, insurance, and miscellaneous support costs are charged to the project account. In the SFC Program, government force account work is performed by government employees under the direction of an IHS construction supervisor. The construction documents will include drawings, technical specifications, schedules and a draft Transfer Agreement. The IHS schedules the work and assures quality control.

Direct Provision by a tribe

Under this method of work, funds obligated in the MOA in accordance with a payment schedule and upon request are contributed to the tribe to construct or procure the sanitation facilities.

Tribal Force Account

In a tribal force account project, the tribe accomplishes the work with tribal employees directed by a tribal construction supervisor who has control of the project at the construction site. Typically, the tribe manages the project funds and provides the equipment, materials, and support. The construction documents will include drawings, technical specifications, schedules and a cost estimate. The IHS role includes providing technical assistance and inspection for quality control during construction. Job-site technical guidance (but not supervision or control) may be provided by a government employee. In a tribal force account situation, ownership of

the facilities, materials, and supplies purchased by the tribe with MOA funds vests with the tribe upon acquisition of materials and installation of the facilities.

Tribal Procurement

In tribal Procurement, the sanitation facilities are procured by the tribe through a contract with another entity. The construction documents will include drawings, technical specifications and a draft tribal contract package meeting the MOA guideline requirements. The ownership vests in the tribe upon final acceptance of completed construction from its contractors.

Direct Provision by a Third-Party

Third-parties can be States, counties, municipalities, housing authorities, rural water districts, non-IHS Indian health clinics, or other non-profit organizations. If a third-party procures the sanitation facilities, ownership vests in the third-party upon final acceptance of the completed construction from its contractor. In accordance with the MOA, the third-party may own and operate the facilities or transfer the facilities to the tribe or to individual Indian recipients.

Third-Party Force Account

The MOA parties may choose to allow the third-party to perform all or a portion of the project with IHS funds. The IHS role could include providing technical assistance and inspection to assure quality control during construction. The construction documents will include drawings, technical specifications, schedules and a cost estimate.

Third-Party Procurement

A third-party to an MOA may use IHS funds to procure the goods and services authorized under P.L. 86-121 to benefit the Indian people. The construction documents will include drawings, technical specifications and a possibly a draft contract package.

See the following for more information on procurement methods:

- Criteria for the Sanitation Facilities Construction Program, June 1999, Chapter 8,
- MOA guidelines for the PL 86-121 SFC Program, Indian Health Manual, Part 5, Chapter 2, September 14, 2007,
- Area Guidelines,
- Technical Assistance Guide – Public Law 638 Construction (Red Book), May 2011.

APPENDIX 7

PROJECT DEVELOPMENT PLAN

TEMPLATE

PROJECT DEVELOPMENT PLAN

[PROJECT NAME]
[TRIBE NAME]
[STATE]

PL-86-121
IHS PROJECT XX-##-XXX
(Only if Project Number has been assigned)

[MONTH] [YEAR]

{The Project Development Plan is a document that describes planning and design activities for an SFC project. It establishes tasks, a schedule, costs, and other requirements for completing planning and design deliverables. A Community System Master Plan and/or Engineering Project Report are potential deliverables that are first planned in a Project Development Plan.}

I. Synopsis

{This is a summary paragraph. Succinctly state:

1. The problem or issue driving the need for planning and design. (ie. The water supply is inadequate.)
2. What planning and design deliverable will be completed. (ie. This planning and design activity will complete a Community System Master Plan or an Engineering Project Report.)
3. What it will cost.
4. Who will provide funds, if known.
5. Who will complete the work (ie. IHS will identify the water supply need and evaluate potential water sources. The tribe will provide environmental information on potential sites and procure test well drilling)}

II. Project Background and Need

{Provide background information that illustrates and supports the need for the project. Relating in terms of SDS deficiency levels is helpful.}

III. Risk Management

{Complete the risk checklist and attach. If there are significant construction project risks, describe them here. If necessary, incorporate items in the scope of work and/or communication plan aimed at mitigating the identified risks.}

IV. Scope of Work

{Describe the tasks that will be completed in order to provide the deliverable. State the entity responsible for completing the tasks, (ie. IHS, tribe, A&E Consultant, etc.).}

V. Task Assignments and Schedule

{Create a milestone or Gantt chart schedule that shows when tasks are scheduled and who is responsible for completing them.}

VI. Human Resources

{Consider overall office workload and skill level. Are the identified resources available to work on the assigned tasks? Are they already allocated to other projects? Are there any special training needs? Identify them here. Since this is a global issue, this section is may be best completed by the District Engineer, especially for large planning/design projects.}

VI. Communications Plan

{Identify project stakeholders, their role in the planning and design project, and how they will be communicated with while the project proceeds.}

VII. Procurement Plan

{If procurement of outside services is needed, describe what the services are and specify the contracting method.}

VIII. Quality Design Plan

{Describe the activities that will be undertaken to assure that the completed deliverables meet the needs of the project stakeholders. (ie. DE reviews of work products, design coordination meetings to invite input on the project, SFC O&M support activities, etc.)}

IX. Cost Estimate and Budget

{If funds are needed to pay for outside services or for activities undertaken by IHS tech support staff, show these costs here. State the source of funds, if known.}

X. Approvals

{Minimum signature approval is the Project Manager and the District Engineer.}

Prepared By:

_____ _____

[NAME] Date
[TITLE]

Reviewed By:

_____ _____

[NAME] Date
District Engineer
[NAME] District Office

{Additional approvals may be necessary when obligating funds or per individual Area practice.}

Approved By:

_____ _____

[NAME] Date
Director, Division of Sanitation Facilities Construction
[NAME] Area Indian Health Service

APPENDIX 8

PROJECT DEVELOPMENT PLAN

EXAMPLE

PROJECT DEVELOPMENT PLAN
PUMPHOUSE & WATER MAIN EXTENSION
FOR THE
PUEBLO OF NAMBE
NAMBE INDIAN RESERVATION

PL-86-121
SDS Project Number: NM26306-1201

April 2010

I. Synopsis

Item	Description
Problem	Nambe only has one water source (Buffalo Well) capable of producing water that meets the Safe Drinking Water Act (SDWA). An arsenic treatment plant is currently operating in order to bring that water source into compliance with SDWA requirements. The cost of this treatment exceeds the Pueblo's financial capacity.
Deliverable (Outcome of PDP execution)	Engineering Project Report
Cost	$0
Funding Source	N/A
Who will complete the work	Mostly the IHS District Engineer, with some assistance from the IHS Engineering Technician (see Section V)

II. Project Background and Need

The Pueblo of Nambe is currently only served by a single well, the Buffalo Well located near the Buffalo Range. Two other wells near the Main Village are offline due to high uranium. The Buffalo Well has arsenic in the raw water between 27 and 33 parts per billon (ppb) which exceeds the EPA Maximum Contaminant Level (MCL) of 10 ppb. The water is currently being treated by an arsenic treatment plant that was constructed as part of an arsenic demonstration project funded by the Environmental Protection Agency to gather data on various arsenic treatment equipment and the associated operation and maintenance costs. IHS has estimated that the annual operation and maintenance costs of this facility will be about $138,000 (see below). Since the water system serves about 200 homes, each home would have to pay $57.63 per month just to cover the cost of the water. With the mean household income reported on the 2000 Census for the Nambe Pueblo of only $30,452, it is unlikely that this cost can fully be placed on the water system users. In addition, the Nambe Pueblo has very little economic enterprises, so the capacity of the Pueblo to subsidize some of these costs is extremely limited. In summary, the existing treatment facility does not appear to sustainable over the long term and it is feared that once EPA's economic support of the facility is withdrawn, that the tribe will stop treatment of the water and will once again exceed the MCL for arsenic.

ESTIMATED ANNUAL OPERATING BUDGET
FOR
PUEBLO OF NAMBE ARSENIC TREATMENT PLANT

ITEM	DESCRIPTION	QUANTITY	UNITS	RATE	TOTAL
1	Annual Capital Cost/Depreciation (Assumes 20 year life)	1	LS	$20,000.00	$20,000.00
2	Media Replacement (Required Every 3 Years)	1	LS	$21,000.00	$21,000.00
3	Media Disposal (Required Every 3 Years)	1	LS	$50,000.00	$50,000.00
4	Carbon Dioxide	1	LS	$8,000.00	$8,000.00
5	Chemicals	1	LS	$1,000.00	$1,000.00
6	Electricity	1	LS	$1,000.00	$1,000.00
7	Laboratory Equipment and Supplies - Reagents - Consumables - Equipment - Repair parts - Contract Testing	1	LS	$4,000.00	$4,000.00
8	Professional Services - Electrician	1	LS	$2,000.00	$2,000.00
9	Operator (Routine Operation @ 2 Hours/Day) - Monitor pH/CO_2 and chlorine residuals - Meter readings and other data collection - Replace CO_2 canisters and chlorine as-needed - General housekeeping - Check water production Record well pumps run times	528	HR	$50.00	$26,400.00
10	Operator (Monthly Activities/Maintenance/Sampling @ 4 Hours/Month) - Record electrical readings - Water quality sampling - Check static water level in wells - Routine maintenance (chemical feed pumps, CO_2 system, etc.)	48	HR	$50.00	$2,400.00
11	Operator (Quarterly Activities/Maintenance/Sampling @ 4 Hours/Quarter) - Water quality/compliance sampling - Calibrate and clean chemical and CO_2 feed systems - Routine maintenance	16	HR	$50.00	$500.00
12	Operator (Yearly Activities/Maintenance/Sampling @ 40 Hours/Year) - Overhaul chemical feed pumps - Check safety equipment - Preventive maintenance on treatment building - Fence & gate repair - Annual budget review/preparation	40	HR	$50.00	$2,000.00

Total Annual O&M Costs for Nambe Arsenic Treatment Plant =	$138,300.00

In 2008, the Bureau of Reclamation (BOR) provided funding to IHS for a new well in Nambe. IHS hired an engineering consultant to perform a hydrogeological study (August 2009) of the Nambe Pueblo and has determined that a new well can be drilled (Little Dam Well) southeast of the Upper Village. Water quality testing and video inspection has been done of the existing irrigation well at the site and has determined that water quality meets all of the requirements of the Safe Drinking Water Act, without treatment. Therefore, a new well will be drilled during the Summer of 2010 in this area.

The goal of this SDS construction project will be to construct a Pumphouse and water main to place this well on-line as the primary water source for the community and to use the Buffalo Well and Arsenic Treatment Plant as a backup source.

III. Scope of Work

The following planning and design activities **will need to be completed** for this project to complete the design:

- An archeological survey of the Pumphouse and water main extension
- A Tribal Cultural Property (TCP) letter and concurrence has been obtained from the State Historic Preservation Officer (SHPO) the Pumphouse and water main extension
- Walk the proposed water main alignment to locate existing utilities along the proposed water main alignment
- Draft final water main alignment; incorporated the existing utilities into the drawings so that the water main alignment can be set to avoid the utilities
- U.S. Army Corps of Engineers Section 404 permits will need to be obtained for the eight (8) arroyo crossings
- Nambe Pueblo or EPA will have to issue a 401 water quality certification for the eight (8) arroyo crossings
- BIA right of way permit will be required for installing the water main within the BIA ROW
- The well pump and water main will need to be sized
- Estimate capital & O&M costs
- Obtain tribal "Buy-In" of the design
- **An Engineering Project Report will be completed.**

IV. Risk Management

Below is a list of risks that have been identified for this project:

Possible Project Risks (*Planning & Design Project*)		
Risk	**Level (Low, Medium, High)**	**Anticipated Effect**
Archeologist busy	High	Increased time
Slow responses from BIA	Medium	Increased time
Slow responses from U.S. Army Corps of Engineers	Low	Increased time
Slow response on the 401 water quality cert.	Medium	Increased time
Poor marking of existing utilities	Medium	Inaccurate drawings

Possible Project Risks (*Construction Project*)		
Risk	**Level (Low, Medium, High)**	**Anticipated Effect**
Rock Excavation	Low	Increased cost, time
Dewatering	Low	Increased cost, time
Archaeology	Medium	Increased cost, time & possible change in water main alignment
Land Issues	Medium	Increased cost, time & possible change in water main alignment
Existing Utilities	Medium	Increased time

V. Task Assignments, Budget, & Schedule

Nambe Pumphouse & Water Main Extension Planning Activities Tasks, Resources, Scheduling, & Cost Estimate

Task	Resource	Cost Estimate				Scheduling (Week #)																							
		Unit	Quanity	Unit Cost	Total Cost	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Arch Survey	BIA	No Cost																											
TCP Letter	I.H.S. DE	No Cost																											
SHPO Concurrence	SHPO	No Cost																											
Walk Alignment & Locate Existing Utilities	I.H.S. Eng Tech	HR	8	$40.00	$320.00																								
Draw Final Water Main Alignment	I.H.S. DE	Program $ - I.H.S. Project																											
Request 404 & 401 Permits	I.H.S. DE	Program $ - I.H.S. Project																											
Request BIA ROW Permit	I.H.S. DE	Program $ - I.H.S. Project																											
Size Well Pump & Water Main	I.H.S. DE	Program $ - I.H.S. Project																											
Calculate Capital & O&M Costs	I.H.S. DE	Program $ - I.H.S. Project																											
Present to Tribe	I.H.S. DE	Program $ - I.H.S. Project																											
Draft EPR	I.H.S. DE	Program $ - I.H.S. Project																											
Total Estimated Cost for Planning Activities =					**$320.00**																								

VI. Human Resources

Most of the work for this project will be completed by an I.H.S. District Engineer and an I.H.S. Technician as shown above. The IHS district engineer will provide oversight and coordination of activities. BIA, U.S. Army Corps of Engineers and EPA/Nambe Pueblo will be required to issue permits for the project. BIA, SHPO, and the Nambe Governor will be contacted for archeological clearance.

VI. Communications Plan

Much of the communications plan was incorporated into Section V above.

VII. Procurement Plan

No procurement is required for these activities.

VIII. Quality Design Plan

Design will be by the I.H.S. district engineer. A design review will be completed and the design review team will be involved in all stages of the project to ensure quality. The engineering report will be stamped by the district engineer with a professional engineering stamp.

IX. Cost Estimate and Budget

Cost is estimated to be approximately $320 to cover the cost of the engineering technician. Since this is a negligible amount, a budget of $0 will be assigned to this PDP and the small cost of the technician's time will be absorbed into other projects. Such a small cost would easily be expended by drafting up a planning agreement for the project if it were decided that funding was necessary to cover this cost.

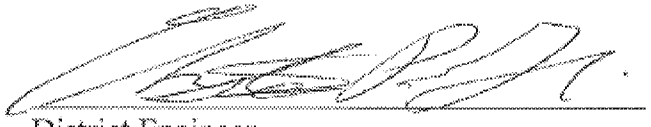
X. Approvals

Prepared By:

District Engineer
Santa Fe District Office

4/15/2010
Date

Reviewed By:



District Engineer
Santa Fe District Office

4/15/2010
Date

Recommended By:

Director, DSFC
Albuquerque Area Indian Health Service

Date

APPENDIX 9

PROJECT DEVELOPMENT PLAN (PDP)

REVIEW SHEET

Project Development Plan Review - Project: _____

Are the following minimum deliverables included in this PDP?

PDP Component	Yes?
Project Background and Need – Description of the problem with applicable background. **Comments:**	☐
Risk Management – A description of how risks will be analyzed and addressed during the planning and design phase. Risk checklist attached. **Comments:**	☐ ☐
Scope of Work – Description of the type of planning document needed and tasks that will be carried out *during the planning and design phase*, by IHS staff, tribe, and outside contractors (when needed). **Comments:**	☐
Schedule – A Gantt chart, milestone schedule, or other similar schedule that shows when the proposed tasks in scope of work will be completed and who will complete them. **Comments:**	☐
Human Resources – Identification of resources available to work on the assigned tasks. **Comments:**	☐
Communications Plan – List of key project stakeholders and roles and how the project manager will communicate with them during the planning and design phase. **Comments:**	☐
Procurement Plan – When needed, a discussion of how the services of outside contractors will be procured. **Comments:**	☐
Quality Assurance Plan – A description of how the scope of work will be carried out to assure the final product is of high quality. **Comments:**	☐
Cost Estimate – An estimate of the costs required to complete the planning and design work. List source of funds, if known. **Comments:**	☐

APPENDIX 10

ENGINEERING PROJECT REPORT (EPR)

TEMPLATE

ENGINEERING PROJECT REPORT

[PROJECT NAME]
[TRIBE NAME]
[STATE]

PL-86-121
IHS SDS PROJECT XX#####-####
(Only if related to an SDS Project)

[MONTH] [YEAR]

Prepared By:

_____ _____

[NAME] Date
[TITLE]

Affix seal here

CONTENTS

e) Land Requirements
f) Potential Construction Problems
*g) Sustainability Considerations**
i) Water and Energy Efficiency
ii) Green Infrastructure
iii) Other
h) Cost Estimates
i) Life Cycle Costs
j) Capacity of Tribe to Operate the Alternative
k) Other Factors

5) SELECTION OF AN ALTERNATIVE

6) PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)
a) Preliminary Project Design
b) Project Schedule
c) Permit Requirements
*d) Sustainability Considerations**
i) Water and Energy Efficiency
ii) Green Infrastructure
iii) Other
e) Total Project Cost Estimate (Engineer's Opinion of Probable Cost)
f) Annual Operating Budget
*i) Incomes**
ii) Annual O&M Costs
*iii) Debt Repayments**
*iv) Reserves**

7) CONCLUSIONS AND RECOMMENDATIONS

TABLES

APPENDICES

** Optional for IHS-funded projects. Required for USDA-funded projects. See Appendix 13.*

EXECUTIVE SUMMARY

Provide a brief review of the project objective, engineering efforts to date, and the proposed project scope.

INTRODUCTION

Provide a brief project background that includes tribal perspective, preliminary design objective and scope, and a summary of Indian homes to receive benefit from the proposed project. Describe preliminary design development activities (records review, survey and mapping, subsurface investigation, evaluation of quantity and quality of flows, hydraulic modeling, geotechnical studies, video surveys, etc.).

1.0 PROJECT PLANNING

Describe the area under consideration. Service may be provided by a combination of central, cluster, and/or centrally managed individual facilities. The description should include the following information:

a) Location. Provide location maps of the project planning area and existing service areas. Include legal and natural boundaries and a topographical map of the service area.

b) Environmental Resources Present. Provide a brief narrative description and maps or photographs of environmental resources present in the project planning area that affect the design of the project. Environmental review information that has already been developed to meet requirements of NEPA or a state equivalent review process can be used here.

c) Population Trends. Provide historical population data for at least the past two decades and population projections for the project planning period. Cite sources of population data.

d) Community Engagement. *Required for USDA-funded projects. See Appendix 13.*

2.0 EXISTING FACILITIES
2.1 EXISTING FACILITIES - WATER SYSTEM

Describe the existing water infrastructure including sources, pipe quantities and sizes, quantity and quality of flows, pumping capacities, and treatment facilities. Include the following details:

a) Location Map. Provide a map and a schematic process layout of all existing facilities including sources, transmission mains, distribution mains, pumping systems, storage, and treatment facilities. Identify facilities that are no longer in use.

b) History. Indicate when major system components were constructed, renovated, expanded, or removed from service. Discuss component failures and their causes.

Describe compliance with applicable regulations and provide a history of applicable violations of regulatory requirements.

c) Condition of Existing Facilities. Describe present condition, suitability for continued use, adequacy of current facilities, and supply, distribution, treatment, and storage capabilities. Describe the existing capacity of each component and include information about pipe materials and sizes. *For USDA-funded projects, include information about overall current energy consumption and an asset management plan. See Appendix 13.*

d) Financial Status of Existing Facilities. *Required for USDA-funded projects. See Appendix 13.*

e) Water/Energy/Waste Audits. *Required for USDA-funded projects. See Appendix 13.*

2.2 EXISTING FACILITIES - WASTEWATER SYSTEM

Describe the existing wastewater system facilities, including pipe quantities and sizes, quantity of flows, pumping capacities, and treatment facilities. Include the following details:

a) Location Map. Provide a map and a schematic process layout of all existing facilities including collection systems, pumping stations, storage, and treatment facilities. Identify facilities that are no longer in use.

b) History. Indicate when major system components were constructed, renovated, expanded, or removed from service. Discuss component failures and their causes. Describe compliance with applicable regulations and provide a history of applicable violations of regulatory requirements.

c) Condition of Existing Facilities. Describe present condition, suitability for continued use, adequacy of current facilities, and conveyance, treatment, storage, and disposal capabilities. Describe the existing capacity of each component and include information about pipe materials and sizes. *For USDA-funded projects, include information about overall current energy consumption and an asset management plan. See Appendix 13.*

d) Financial Status of Existing Facilities. *Required for USDA-funded projects. See Appendix 13.*

e) Water/Energy/Waste Audits. *Required for USDA-funded projects. See Appendix 13.*

2.3 EXISTING FACILITIES - SOLID WASTE SYSTEM

Describe the existing solid waste system facilities including the following details:

a) Location Map. Provide a map and a schematic process layout of all existing facilities including collection, storage, processing, and disposal facilities.

b) History. Indicate when major system components were constructed, renovated, expanded, or removed from service. Discuss component failures and their causes. Describe compliance with applicable regulations and provide a history of applicable violations of regulatory requirements. Briefly discuss the practice of illegal dumping in the service area.

c) Condition of Existing Facilities. Describe present condition, suitability for continued use, adequacy of current facilities, and collection, processing, storage, and disposal capabilities. Describe the existing capacity of each component. *For USDA-funded projects, include information about overall current energy consumption and an asset management plan. See Appendix 13.*

d) Financial Status of Existing Facilities. *Required for USDA-funded projects. See Appendix 13.*

e) Water/Energy/Waste Audits. *Required for USDA-funded projects. See Appendix 13.*

3.0 NEED FOR PROJECT

Describe the needs including the following:

a) Health, Sanitation, and Security. Describe concerns and include relevant regulations and correspondence from/to federal and state regulatory agencies. Include copies of such correspondence as an attachment to the Report.

b) Aging Infrastructure. Describe the concerns and indicate those with the greatest impact. Describe water loss, inflow and infiltration, treatment or storage needs, management adequacy, inefficient designs, safety concerns, and other problems.

c) Reasonable Growth. Provide an estimate of future demands on the infrastructure, based on the design life of the proposed infrastructure. Facilities proposed to be constructed to meet future growth needs should generally be supported by additional revenues. Consideration should be given to designing for phased capacity increases. Provide number of new customers committed to this project.

4.0 ALTERNATIVES CONSIDERED

Describe all alternatives considered in planning a solution to meet the identified needs. Technically infeasible alternatives that were considered should be mentioned briefly along with an explanation of why they are infeasible, but do not require full analysis.

For USDA-funded projects, alternative approaches to ownership and management, system design (including resource efficient or green alternatives), and sharing of services, including various forms of partnerships, should be considered. See Appendix 13.

Include the following information for each technically feasible alternative considered:

a) Description. Describe the facilities associated with every technically feasible alternative. Describe source, conveyance, treatment, storage and distribution facilities for each alternative. A feasible system may include a combination of centralized and decentralized (on-site or cluster) facilities.

b) Design Criteria. State the design parameters used for evaluation purposes. These parameters should comply with federal, state, and agency design policies and regulatory requirements.

c) Map. Provide a schematic layout map to scale and a process diagram if applicable. If applicable, include future expansion of the facility.

d) Environmental Impacts. Provide information about how the specific alternative may impact the environment. Describe all direct and indirect impacts on floodplains, wetlands, important land resources, endangered species, historical and archaeological properties, etc., as they relate to each alternative. *For USDA-funded projects, include generation and management of residuals and wastes.*

e) Land Requirements. Identify sites and easements required and specify the disposition of the properties (currently owned, to be acquired, leased, access agreement, etc.).

f) Potential Construction Problems. Discuss concerns such as subsurface rock, high water table, limited access, existing resource or site impairment, or other conditions which may affect cost of construction or operation of facility.

g) Sustainability Considerations. *Required for USDA-funded projects. See Appendix 13.*

h) Cost Estimates. Provide cost estimates for each alternative, including a breakdown of the following costs associated with the project: construction, non-construction, and annual O&M costs. A construction contingency should be included as a non-construction cost. Cost estimates should be included with the descriptions of each technically feasible alternative. O&M costs should include a rough breakdown by O&M category (see example below) rather than a lump sum value. The cost derived will be used in the life cycle cost analysis.

Example O&M Cost Estimate

Category	**Cost**
Salaries/Benefits	
Office Supplies/Printing	
Water Purchase or Waste Treatment Costs	
Insurance	
Fuel	
Electrical	
Chemical	
Analytical	
Maintenance/Repairs	
Professional Fees	
Residuals Disposal	
Miscellaneous	
Total	

i) Life Cycle Costs. A life cycle present worth cost analysis should be completed for each technically feasible alternative. Do not leave out alternatives because of anticipated

costs; let the life cycle cost analysis show whether an alternative may have an acceptable cost. Several analyses may be required if the project has different aspects, such as one analysis for different types of collection systems and another for different types of treatment.

1. The analysis should convert all costs to present day dollars;
2. The planning period to be used is recommended to be 20 years, but may be any period determined reasonable by the engineer and concurred on by the state or federal agency;
3. The discount rate to be used should be the "real" discount rate taken from Appendix C of OMB circular A-94 and found at (www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html);
4. The total capital cost (construction plus non-construction costs) should be included;
5. Annual O&M costs should be converted to present day dollars using a uniform series present worth (USPW) calculation;
6. The salvage value of the constructed project should be estimated using the anticipated life expectancy of the constructed items using straight line depreciation calculated at the end of the planning period and converted to present day dollars;
7. The present worth of the salvage value should be subtracted from the present worth costs;
8. The net present value (NPV) is then calculated for each technically feasible alternative as the sum of the capital cost (C) plus the present worth of the uniform series of annual O&M (USPW (O&M)) costs minus the single payment present worth of the salvage value (SPPW(S)):

$$NPV = C + USPW\ (O\&M) - SPPW\ (S)$$

9. A table showing the capital cost, annual O&M cost, salvage value, present worth of each of these values, and the NPV should be developed for state or federal agency review. All factors (major and minor components), discount rates, and planning periods used should be shown within the table.
10. Short lived asset costs (e.g. the cost of replacing pumps) should also be included in the life cycle cost analysis if determined appropriate by the consulting engineer or agency. Life cycles of short lived assets should be tailored to the facilities being constructed and be based on generally accepted design life. Different features in the system may have varied life cycles.

j) Capacity of Tribe to Operate and Maintain the Alternative. Provide an analysis of the alternative's complexity and the required resources (technical, financial, managerial) and operator training requirements to properly operate the alternative.

k) Other Factors. Other factors, including social and environmental aspects (e.g. permit issues, community objections, reduction of greenhouse gas emissions, wetland relocation) should also be considered in determining which alternative is recommended and may be factored into the calculations. If water reuse and conservation, energy efficient design, and/or renewable generation of energy components are included in the proposal, include

a separate life cycle cost analysis of these components to show net present value of the capital costs, energy costs savings, available energy rebates, pay-off timeline, and salvage value that are expected to result.

5.0 SELECTION OF AN ALTERNATIVE

Selection of an alternative is the process by which data from the previous section, "Alternatives Considered" is analyzed in a systematic manner to identify a recommended alternative. The analysis should include consideration of both life cycle costs and non-monetary factors (i.e. triple bottom line analysis: financial, social, and environmental).

6.0 PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)

For the recommended project, elaborate on the preliminary description from Section 4, including the following:

a) Preliminary Project Design.
Provide preliminary project design information including a list of proposed drawing sheets, required site work, a location map of the proposed facilities, process schematics, operational considerations, and control mechanisms, where applicable.

i) Drinking Water:

Water Supply. Include requirements for quality and quantity. Describe recommended source, including site and allocation allowed.

Treatment. Describe process in detail (including whether adding, replacing, or rehabilitating a process) and identify location of plant and site of any process discharges. Identify capacity of treatment plant (i.e. Maximum Daily Demand).

Storage. Identify size, type and location.

Pumping Stations. Identify size, type, location and any special power requirements. For rehabilitation projects, include description of components upgraded.

Distribution. Include length, material, size, and layout of pipes and key components.

ii) Wastewater:

Collection System Layout. Include length, material, size, and layout of pipes and key components.

Pumping Stations. Identify size, type, site location, and any special power requirements. For rehabilitation projects, include description of components upgraded.

Storage. Identify size, type, location, and frequency of operation.

Treatment. Describe process in detail (including whether adding, replacing, or rehabilitating a process) and identify location of any treatment units and site of any

discharges (end use for reclaimed water). Identify capacity of treatment plant (i.e. Average Daily Flow).

iii) Solid Waste:

Collection. Describe process in detail and identify quantities of material (in both volume and weight), length of transport, location and type of transfer facilities, and any special handling requirements.

Storage. If any, describe capacity, type, and site location.

Processing. If any, describe capacity, type, and site location.

Disposal. Describe process in detail and identify permit requirements, quantities of material, recycling processes, location of plant, and site of any process discharges.

iv) Stormwater:

Collection System Layout. Include length, material, size, and layout of pipes and key components.

Pumping Stations. Identify size, type, location, and any special power requirements.

Treatment. Describe treatment process in detail. Identify location of treatment facilities and process discharges. Capacity of treatment process should also be addressed.

Storage. Identify size, type, location and frequency of operation.

Disposal. Describe type of disposal facilities and location.

Green Infrastructure. *Required for USDA-funded projects. See Appendix 13.*

b) Project Schedule. Identify proposed dates for submittal and anticipated approval of all required documents, land and easement acquisition, permit applications, advertisement for bids, loan closing, contract award, initiation of construction, substantial completion, inspection, final completion, operator training, initiation of operation, and submission of record drawings.

c) Permit Requirements. Provide an assessment of jurisdiction and identify any construction permits and easements as well as any discharge and capacity permits that will/may be required as a result of the project.

d) Sustainability Considerations (if applicable). *Required for USDA-funded projects. See Appendix 13.*

e) Total Project Cost Estimate (Engineer's Opinion of Probable Cost). Provide an itemized estimate of the project cost based on the stated period of construction. Include construction, land and rights-of-way, legal, engineering, construction program management, funds administration, interest, equipment, construction contingency, refinancing, and other costs associated with the proposed project. An appropriate construction contingency should be added as part of the non-construction subtotal. For projects containing both water and waste disposal systems, provide a separate cost

estimate for each system as well as a grand total. If applicable, the cost estimate should be itemized to reflect cost sharing including apportionment between funding sources. The engineer may rely on the owner for estimates of cost for items other than construction, equipment, and engineering.

f) Annual Operating Budget. Provide itemized annual operating budget information.

i) Income. *Required for USDA-funded projects. See Appendix 13.*

ii) Annual O&M Costs. Provide an itemized list by expense category and project costs realistically. Provide projected costs for operating the system as improved. In the absence of other reliable data, base the estimate on actual costs of other facilities of similar size and complexity. Include facts in the Report to substantiate O&M cost estimates. Include salaries, benefits, water purchase, taxes, accounting and auditing fees, legal fees, interest, utilities, oil and fuel, insurance, annual repairs and maintenance, supplies, chemicals, office supplies, printing, energy costs, and miscellaneous as applicable. Any income from renewable energy generation which is sold back to the electric utility should also be included, if applicable. If applicable, note the operator grade needed.

Include a Schedule of Costs Table to demonstrate to the tribe their approximate annual financial commitment to the proper operation and maintenance of the facility over the entire design life of the facility. The Schedule of Costs Table should include estimated one time maintenance costs and short lived asset costs such as tank painting, pump replacement, and filter media replacement.

iii) Debt Repayments. *Required for USDA-funded projects. See Appendix 13.*

iv) Reserves. *Required for USDA-funded projects. See Appendix 13.*

g) Operation and Maintenance Needs. Provide a robust description of the O&M requirements and the capacity of the tribe to operate and maintain the selected alternative. Describe the operation and maintenance organization needs, including start-up requirements, operator certification level, and operator training. Include an improvement plan when necessary.

h) Environmental Assessment. Provide an assessment of jurisdiction and discuss the general environmental requirements and background environmental information adequate for NEPA determination.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Provide any additional findings and recommendations that should be considered in developing the project. This may include recommendations for special studies, highlighting of the need for special coordination, a recommended plan of action to expedite project development, and any other information as local conditions require.

APPENDIX 11

ENGINEERING PROJECT REPORT (EPR)

EXAMPLE

ENGINEERING PROJECT REPORT

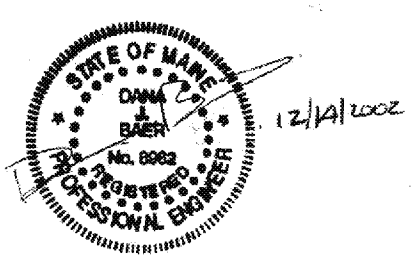
for

SEWER COLLECTION SYSTEM EXPANSION

Serving the
MASHANTUCKET PEQUOT
TRIBAL NATION

December 2002

PREPARED FOR THE MASHANTUCKET PEQUOT TRIBAL NATION



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FIGURES

EXECUTIVE SUMMARY

The Mashantucket Pequot Tribal Nation requested that the Indian Health Service (IHS) undertake a preliminary design for an expansion of their existing sewage collection system to accommodate flows from approximately 225 new homes. The homes are proposed to be constructed in three phases in areas identified as Hidden Acres, the 770 Shewville Site, and the 38 Indiantown Site. This engineering report is limited to an evaluation of the offsite wastewater collection infrastructure necessary to serve the proposed housing sites.

The evaluation identified two feasible alternatives to serve the new home sites. Both of the proposed alternatives include collecting wastewater from the proposed housing sites and pumping it into a replacement lift station to be constructed at the location of the existing Elizabeth George Drive Lift Station. Alternative 1, at a capital cost estimated to be $2,606,725, can serve all three proposed housing sites with gravity sewer lines to one lift station. Alternative 2, at a capital cost estimated to be $2,433,350, would require three lift stations to serve the three proposed housing sites.

Recommendations

Alternative 1 is recommended despite being estimated to require approximately 7% higher capital than Alternative 2. Alternative 1 offers the advantage of two fewer sewage lift stations than Alternative 2 and eliminates the need for 6 individual lift stations. It further offers the advantage of only requiring easements and right-of-way over two privately-owned parcels versus 18 parcels for Alternative 2. This will result in significantly lower operating costs and will help to minimize tribal infrastructure in the residential areas of the proposed housing sites.

INTRODUCTION

The tribe requested that the Indian Health Service (IHS) undertake a preliminary design of an expansion of their existing sewage collection system to accommodate flows from approximately 225 new homes. The population of the reservation is expected to grow in response to the increased job opportunities afforded by the construction and operation of the casino. In addition to various Tribal facilities and the casino and hotel, there are 68 homes on the reservation that are served with water and wastewater utilities operated by the Mashantucket Pequot Tribal Nation Utility.

The Nation is proposing to construct the homes in three phases. One phase proposes to construct between 80 and 100 new homes in an area identified as Hidden Acres. The Hidden Acres site is located approximately 3,600 feet southwest of existing Nation housing on Pequot Circle and is roughly bounded by Iron Street/Rt 214 on the south, the Shewville Road on the east, Spicer Hill Road on the west and Silas Dean Road on the north. Another phase proposes to construct approximately 50 additional homes in an area identified as the 770 Shewville site. The 770 Shewville site is located due east of the Hidden Acres site across Shewville Road and north of Route 214 approximately 2,200 feet west of existing Nation housing on Ann Wampy Drive. A third phase proposes to construct between 50 and 75 new homes in an area known as 38 Indian

Town. A preliminary site layout of this parcel indicates 58 building lots. The 38 Indian Town site is located east of the intersection of Indiantown Road/Route 214 and Shewville Road.

This engineering report examines improvements to the existing wastewater collection system located south and west of the existing sewage treatment plant. The tribe has reported that the existing wastewater treatment plant has adequate capacity to treat the additional flows from the new housing and as such this report does not evaluate the capacity of the treatment plant to treat current or future wastewater flows. Future expansion of the collection system required by resort or housing expansion to the north and east of the existing treatment plant is not considered in this report, nor is the adequacy of the existing collection system north and east of the plant evaluated.

1.0 PROJECT PLANNING

a) Location. Figure 1 shows the proposed housing sites and existing service area. Figures 2 and 2A show the existing service area and sanitation facilities.

b) Environmental Resources Present. There are wetlands located in the project area.

c) Population Trends. According to the U.S. census, the total population for the Mashantucket Pequot Reservation and Off-Reservation Trust Land in 1990 and 2000 population was 320 and 325, respectively. Assuming exponential population growth and using a growth rate of 1.1% (United Nations population growth projection for U.S. total population), the projected population of the Mashantucket Pequot Tribe in 2035 is 477 people.

d) Community Engagement. Not examined for this project.

2.1 EXISTING FACILITIES - WATER SYSTEM

Not applicable to this project.

2.2 EXISTING FACILITIES - WASTEWATER SYSTEM

The existing wastewater collection system consists of two areas. The north area serves the Foxwoods Resort complex and related facilities and the drinking water treatment plant. The focus of this engineering report is the south area, which serves a variety of Tribal buildings and businesses and individual residences. The south area of the wastewater system is comprised of approximately 11,400 linear feet of 8-inch gravity sewer lines, 4,500 linear feet of 10-inch gravity lines, 1,200 linear feet of 2-inch force mains, 2,000 linear feet of 2 ½-inch force mains, 890 linear feet of 3-inch force mains, 320 linear feet of 4-inch force mains, 2,600 linear feet of 6-inch force mains, and 5 sewage lift stations. Three of the lift stations are Gorman Rupp suction lift stations and two are submersible wet well stations. The general layout of the south area of the existing wastewater system is shown in Figure 2. There are currently sixty-eight homes connected to the south area system, serving approximately 1,000 residents. Additionally, twenty-one tribal, institutional, or commercial buildings are served by the system. The existing wastewater treatment plant is located in the south area.

a) Location Map. Figures 2 and 2A show the existing wastewater collection system and lift stations.

b) History. The wastewater treatment plant was upgraded by Metcalf and Eddy in 1993. The Route 214 Lift Station and the Pequot Trail Lift Station were constructed in 1994 and are currently considered to be adequate by the tribe.

c) Condition of Existing Facilities. The 1993 wastewater treatment plant upgrade increased plant capacity from 1.0 MGD to 3.6 MGD and significantly improved effluent quality. The facility is currently operating at less than 38% capacity, treating 1.1 to 1.4 MGD.

Lift Stations
The Pequot Circle and Elizabeth George Drive Lift Station are reportedly in need of upgrading. Although the tribe reportedly made improvements to the Community Center Lift Station, it requires further modifications to address confined space and electrical code compliance issues. This engineering report does not include an evaluation of the desired upgrade to either the Community Center or the Pequot Circle Lift Station.

Gravity Sewer Line
An evaluation of the wastewater collection system's performance under current flow conditions showed that the depth in one section of 8-inch gravity sewer line may exceed the recommended maximum depth of 60% of the pipe. The analysis showed that the wastewater reached a depth of 66% of the pipe when the model assumed instantaneous peak flow discharges from both homes and tribal buildings in addition to discharges from all lift stations. This is an unlikely scenario and the fact that only one section of the gravity sewer line exceeded design flow depths indicates that the system is robust enough to withstand peak conditions.

d) Financial Status of Existing Facilities. Not examined for this project.

e) Water/Energy/Waste Audits. Not examined for this project.

2.3 EXISTING FACILITIES - SOLID WASTE SYSTEM

Not applicable to this project.

3.0 NEED FOR PROJECT

a) Health, Sanitation, and Security. The tribe is currently in compliance with all applicable regulations. The purpose of this project is to satisfy future demand due to proposed new housing developments.

b) Aging Infrastructure. For the purpose of this report, the wastewater collection system was considered to be in good condition and well maintained. Failure to adequately maintain sewer collection lines can lead to diminished flows in gravity lines and excessive dynamic head losses in force mains. Television inspection of the existing lines was not conducted

prior to completion of this report. Should the tribe feel that it is necessary to confirm existing conditions in the wastewater collection system, inspection can be completed at the early stages of the final design.

c) Reasonable Growth. An evaluation of the hydraulic performance of the existing system under future flow conditions with all three housing sites fully developed was performed. The evaluation was intended to identify potential inadequacies in the existing infrastructure that would limit the carrying capacity of the system to accept increased flows resulting from the proposed housing projects. The evaluation identified three sections of the existing 8-inch gravity line between Ephram's Path and the Pequot Trail Lift Station that appear to exceed 60% depth at future instantaneous peak flow. The worst of these cases is a 75% full sewer between Manhole PT-22 and Manhole PT-21. Two other sections, between Manhole PT-24 and Manhole PT-23 and between Manhole PT-21 and Manhole PT-20 flow to 66% and 65% full respectively. Appendix D summarizes the estimates of daily total flow, daily average flow, and instantaneous peak flow under future conditions. Even at future instantaneous peak flow, sewer surcharge does not appear to occur. The force main between the Pequot Trail Lift Station and Manhole PT-12 located in front of the Tribal Museum is adequate to accept the additional flows and will not require upgrading.

Although the future treatment performance of the wastewater treatment plant was not specifically evaluated as part of this report, flows resulting from the proposed housing are not anticipated to exceed the hydraulic capacity of the wastewater treatment plant.

The additional flows from the proposed housing will affect the pump run time cycles for Elizabeth George Drive Lift Station, the Pequot Trail Lift Station, and the Route 214 Lift Station. The existing and future flow conditions for the lift stations are included in Appendix E.

4.0 ALTERNATIVES CONSIDERED

Two alternatives for the offsite wastewater collection infrastructure are considered in this report. A third alternative which would involve pumping into the existing Pequot Circle Lift Station, is not included in this report because the location and small size of the force main leaving the station preclude it as an option for disposal of the large quantities of wastewater anticipated from the proposed housing. This engineering report does not evaluate an alternative for on-site wastewater collection infrastructure at each site.

Regardless of the alternative selected, the Elizabeth George Drive Lift Station will be replaced with a new facility and a new force main to serve the lift station will be constructed in the same right of way as the existing force main. Additionally, both alternatives require that the existing Gormann-Rupp T-series pumps in the Pequot Trail Lift Station be re-sheaved to increase the rotational speed. This will allow the pump output to increase from the existing 108 gallons per minute to approximately 150 gallons per minute.

Alternative 1

a) Description. Under Alternative 1 wastewater from the Hidden Acres site flows east northeast through approximately 2,400 feet of 8-inch PVC gravity sewer line to a point located near the southeast corner of the 770 Shewville site adjacent to the Shewville Road. At that point, wastewater flowing by gravity from the 770 Shewville site will join the Hidden Acres flows and continue through approximately 3,150 feet of 8-inch PVC gravity sewer line to the proposed Indiantown Lift Station. Wastewater from the proposed homes located on the 38 Indiantown site will flow by gravity through approximately 1,650 feet of 8-inch PVC sewer line, also to the proposed Indiantown Lift Station.

The Indiantown Lift Station is proposed to be located adjacent to Shewville Road on the 38 Indiantown site at an elevation of approximately 95 feet. This new station will be enclosed in a 14- by 20-foot split face concrete block building similar in appearance to the Pequot Trail Lift Station and furnished with an 8-foot diameter wetwell. The station will include duplex, series-connected Gormann-Rupp T3A-B suction lift pumps equipped with 20 horsepower motors rotating at 2,150 RPM. The hydraulic capacity of the station will be approximately 150 gallons per minute at 197 feet of head. Lead-lag pump operation with automatic lead pump alternating and alarms will be controlled by non-mercury float switches located in the wetwell. A 60-kilowatt Onan Model GGHE propane-fired emergency generator complete with an automatic transfer switch will also be housed in the lift station.

Wastewater will be pumped from the Indiantown Lift Station through a 3,400-foot fusion-welded 6-inch high density polyethylene force main to the replacement lift station located at the end of Elizabeth George Drive.

b) Design Criteria. The force main design is based on the competing need to maintain adequate scour velocity in the force mains and the need to minimize dynamic head loss due to friction of the moving liquid against the sidewall of the pipe. Adequate scour is generally considered to be between 2 and 5 feet per second. Velocities in excess of 5 feet per second can result in water hammer and significant damage when the pumps start and stop.

The minimum bury for the proposed gravity sewer lines in Alternative 1 is 5.8 feet above the pipe and the average bury for the lines is 9.1 feet. The minimum bury for the proposed force mains is 5.5 feet above the pipe. It should be noted that the elevations used in the preliminary design are based on 5-foot contours taken from digitized photogrammetry provided by the tribe. Grade or elevation sensitive engineering must be verified during the final design stage.

Among the primary considerations used for this preliminary design was the desire to minimize long term operation and maintenance expense associated with the new facilities, continued use of similar or identical materials and brands already used by the Pequot Tribal Utility in existing facilities, and use of standard construction means and methods.

c) Map. Figures 5 and 6 show the schematic layout for Alternative 1.

d) Environmental Impacts. The sewer line between the proposed manhole identified as Manhole IT-2 and the proposed Indiantown Lift Station will cross wetlands, requiring a General Permit Authorization.

e) Land Requirements. The project will require easements or right-of-way from two private property owners, the Town of Ledyard, and the State of Connecticut Department of Transportation. The project will also require a General Permit Authorization for Placement of Utilities within Inland Wetlands and a public sewer permit. Temporary construction easements will be required for the initial construction and permanent maintenance easements will be required to allow maintenance of the portions of the proposed collection system not on Tribal land. The maintenance easements should be no less than 20 feet in width for linear infrastructure, and a minimum of 30-foot diameter around each manhole.

f) Potential Construction Problems. Bedrock is anticipated throughout the proposed project location. The cost estimates are based on an average depth to ledge to be 1.5 feet throughout.

g) Sustainability Considerations. Not examined for this project.

h) Cost Estimates. Table 1 contains a capital cost estimate of Alternative 1 based on the completed preliminary design. The estimate indicates subtotals for each site, but it should be noted that the site subtotals do not each represent a stand-alone project. For example, service to the Hidden Acres site also requires construction of the Indiantown Lift Station and force main and upgrade to the existing infrastructure to make a complete system. Table 2 shows a breakdown of estimated annual operation and maintenance costs.

Table 1
Capital Cost Estimate
Alternative 1

Description	**Total Cost**	
Construction	$	1,981,925
Permits	$	15,000
Engineering Services	$	269,800
Contingency (15%)	$	340,009
Total Construction + Non construction	$	2,606,725
Annual O&M Costs	$	34,820

Table 2
Annual O&M Cost Estimate
Alternative 1

Category	**Cost**
Salaries/Benefits	$25,000
Office Supplies/Printing	$500
Insurance	$1,000
Fuel	$1,200
Electrical	$1,400

Chemical	$700
Analytical	$120
Maintenance/Repairs	$2,400
Professional Fees	$500
Miscellaneous	$2,000
Total	$34,820

i) Life Cycle Costs.

Table 3
Life Cycle Costs Summary Table
Alternative 1

Planning Period (years)	**35**		
Discount Rate (%)	**5**		
Description	**One Time Costs ($)**	**Annual Recurring Costs ($)**	**Present Value ($)**
Capital Cost	$2,606,725	$0	$2,606,725
O&M Costs	$24,000	$34,820	$578,698
Salvage Value	$0	$0	$0
		Total Net Present Value	$3,185,423

j) Capacity of Tribe to Operate and Maintain the Alternative. Wastewater operators employed by the Mashantucket Pequot Tribal Nation Utility are certified by the State of Connecticut. The operators have the required certification levels to operate and maintain the wastewater treatment plant at the estimated future flow rates expected as a result of the housing developments.

k) Other Factors. None.

Alternative 2

a) Description. Alternative 2 differs from Alternative 1 significantly in that neither the Hidden Acres nor the 770 Shewville site is served with a gravity sewer. This alternative requires a total of three new lift stations in addition to the improvements to the existing wastewater collection system described above. In Alternative 2, all of the Hidden Acres and Shewville sites can be served with gravity sewers to lift stations located at each site, and all of the 38 Indiantown site except for the six lots identified by the tribe adjacent to the Shewville Road can be served with gravity sewer. Those six lots will require individual grinder pump stations for wastewater disposal to the proposed Indiantown Lift Station. The locations of the Alternative 2 lift stations are shown on Figure 7.

Under Alternative 2 wastewater from the Hidden Acres site is collected in a 6-foot precast wetwell at the proposed Hidden Acres Lift Station. This new station will be enclosed in a 14- by 20-foot split face concrete block building similar in appearance to the Pequot Trail Lift Station and furnished with duplex Gormann-Rupp T3A-B suction lift pumps equipped with 15 horsepower motors rotating at 1,850 RPM. The hydraulic capacity of the station

will be approximately 115 gallons per minute at 62 feet of head when only the Hidden Acres Lift Station is operating, and 109 gallons per minute when both the Hidden Acres and Shewville Lift Stations are operating. Lead-lag pump operation with automatic lead pump alternating and alarms will be controlled by non-mercury float switches located in the wetwell. A 35-kilowatt Onan Model GGFD propane-fired emergency generator complete with an automatic transfer switch will also be housed in the lift station.

The Hidden Acres Lift Station will pump through approximately 4,260 feet of fusion-welded 4-inch high-density polyethylene force main to a point located near the intersection of Shewville and Indiantown Road. At that point, wastewater flows from the 770 Shewville site will combine with the Hidden Acres flows and continue through approximately 1,790 feet of fusion-welded 6-inch high-density polyethylene force main to discharge into a manhole identified as Manhole IT-8 at an elevation of approximately 155 feet and subsequently gravity flow to the proposed Indiantown Lift Station. Wastewater from the proposed homes located on the 38 Indiantown site will also flow by gravity through approximately 1,800 feet of 8-inch PVC sewer line to the proposed Indiantown Lift Station. Under Alternative 2 wastewater from the Shewville site will be collected in a 6-foot precast wetwell at the proposed Shewville Lift Station. This new station will be enclosed in a 14-by 20-foot split face concrete block building similar in appearance to the Pequot Trail Lift Station and furnished with duplex Gormann-Rupp T3A-B suction lift pumps equipped with 15 horsepower motors rotating at 1,750 RPM. The hydraulic capacity of the station will be approximately 83 gallons per minute at 61 feet of head when only the Shewville Lift Station is operating, and 77 gallons per minute when both the Shewville and Hidden Acres Lift Stations are operating. Lead-lag pump operation with automatic lead pump alternating and alarms will be controlled by non-mercury float switches located in the wetwell. A 35-kilowatt Onan Model GGFD propane-fired emergency generator complete with an automatic transfer switch will also be housed in the lift station.

The Shewville Lift Station will pump through approximately 800 feet of fusion-welded 3-inch high-density polyethylene force main to a point located near the intersection of Shewville and Indiantown Road. At that point, the Shewville wastewater combines with the Hidden Acres flows and continues to Manhole IT-8 and subsequently to the proposed Indiantown Lift Station as described above in this section.

The proposed location of the Indiantown Lift Station for Alternative 2 is different than that for Alternative 1. The Alternative 2 Indiantown Lift Station is proposed to be located on the 38 Indiantown site at a point south of Indiantown Road at an elevation of approximately 110 feet. This new station will be furnished with an 8-foot diameter wetwell and duplex, series-connected Gormann-Rupp T3A-B suction lift pumps equipped with 15 horsepower motors rotating at 1,920 RPM. The hydraulic capacity of the station will be approximately 150 gallons per minute at 178 feet of head. Lead-lag pump operation with automatic lead pump alternating and alarms will be controlled by non-mercury float switches located in the wetwell. A 35-kilowatt Onan Model GGFD propane-fired emergency generator complete with an automatic transfer switch will also be housed in the lift station.

Wastewater from Indiantown Lift Station will be pumped through a 1,900-foot fusion-

welded 6-inch high density polyethylene force main to the replacement lift station located at the end of Elizabeth George Drive. From that point it is pumped to Manhole EP-22 as described above.

b) Design Criteria. The minimum bury for the proposed gravity sewer lines is 5.8 feet above the pipe and the average bury for the lines is 6.8 feet. The deepest section of the proposed gravity sewer is approximately 10 deep. This deep section is located between Manhole IT-3 and the proposed Indiantown Lift Station. The minimum bury for the proposed force mains is 5.5 feet above the pipe.

c) Map. Figures 7 and 8 show the schematic layout for Alternative 2.

d) Environmental Impacts. The alignment of the proposed lines skirts the wetlands area, therefore eliminating the need to obtain a General Permit Authorization.

e) Land Requirements. The project will require easements or right-of-way from eighteen private property owners, the Town of Ledyard, and the State of Connecticut Department of Transportation. The project will also require a public sewer permit. Temporary construction easements will be required for the initial construction and permanent maintenance easements will be required to allow maintenance of the portions of the proposed collection system not on Tribal land. The maintenance easements should be no less than 20 feet in width for linear infrastructure, and a minimum of 30-foot diameter around each manhole.

f) Potential Construction Problems. Bedrock is anticipated throughout the proposed project location. The cost estimates are based on an average depth to ledge to be 1.5 feet throughout.

g) Sustainability Considerations. Not examined for this project.

h) Cost Estimates. Table 4 contains a capital cost estimate for Alternative 2. The estimate indicates subtotals for each site, but it should be noted that the site subtotals do not each represent a stand-alone project. For example, service to the Hidden Acres site also requires construction of the Indiantown Lift Station and force main and upgrade to the existing infrastructure to make a complete system. Table 5 shows a breakdown of estimated annual operation and maintenance costs.

Table 4
Capital Cost Estimate
Alternative 2

Description	**Total Cost**
Construction	$ 1,825,350
Permits	$ 30,000
Engineering Services	$ 260,600
Contingency (15%)	$ 317,393
Total Construction + Non construction	$ 2,433,350
Annual O&M Costs	$ 42,000

Table 5
Annual O&M Cost Estimate
Alternative 2

Category	Cost
Salaries/Benefits	$25,000
Office Supplies/Printing	$500
Insurance	$1,400
Fuel	$2,300
Electrical	$4,400
Chemical	$700
Analytical	$120
Maintenance/Repairs	$4,000
Professional Fees	$500
Miscellaneous	$3,080
Total	$42,000

i) Life Cycle Costs.

Table 6
Life Cycle Costs Summary Table
Alternative 2

Planning Period (years)	**35**		
Discount Rate (%)	**5**		
Description	**One Time Costs ($)**	**Annual Recurring Costs ($)**	**Present Value ($)**
Capital Cost	$2,433,350	$0	$2,433,350
O&M Costs	$60,000	$42,000	$704,814
Salvage Value	$0	$0	$0
		Total Net Present Value	$3,138,164

j) Capacity of Tribe to Operate and Maintain the Alternative. Wastewater operators employed by the Mashantucket Pequot Tribal Nation Utility are certified by the State of Connecticut. The operators have the required certification levels to operate and maintain the wastewater treatment plant and lift stations at the estimated future flow rates expected as a result of the housing developments.

k) Other Factors. None.

5.0 SELECTION OF AN ALTERNATIVE

Alternative 1 is recommended despite being estimated to require approximately 7% higher capital than Alternative 2. Upgrades are required to existing sewage collection and pumping infrastructure but are equal in both alternatives. The significant difference is that Alternative 1 offers the advantage of two fewer sewage lift station than Alternative 2 and eliminates the need for 6 individual lift stations. It further offers the advantage of requiring easements and right-of-

way over two privately-owned parcels versus eighteen parcels for Alternative 2. This will permanently result in significantly lower operating costs for the recommended alternative. The estimated annual operating cost for Alternative 1 is $35,000 (Table 2) compared to $42,000 for Alternative 2 (Table 5). As shown in Table 3, the estimated net present value of the operation and maintenance costs for Alternative 1 over a thirty-five year planning period is $578,698, which is approximately 18% lower than the estimated net present value of $704,814 for the operation and maintenance costs for Alternative 2, as shown in Table 6. Another advantage is that Alternative 1 will minimize tribal infrastructure in the residential areas of the proposed housing sites.

6.0 PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)

a) Preliminary Project Design.

Wastewater Collection System Layout. The proposed force mains are proposed to be constructed of fused SDR 11 high density polyethylene (HDPE) pipe. The choice of butt-welded joints or joints coupled with electrofusion couplings can be left to the contractor that installs the sewer force mains. The average bury of the force mains is proposed to be 5 feet above the top of pipe. Pass through manholes with blind-flanged access wyes are proposed to be of precast concrete with offset cones and riser rings to match finish grade on roads and finish grade plus 0.5 feet when located off roads or traveled ways. The maximum distance between these manholes is proposed to be 400 feet. All gravity sewers identified to serve the proposed building sites are laid out with a minimum of 0.4% grade and designed to flow at a maximum depth of 60% at the instantaneous peak flow condition. Rubber gasketed PVC SDR 35 sewer pipe is proposed to be used for all gravity sewers. Manholes are proposed to be of precast concrete with offset cones and riser rings to match finish grade on roads and finish grade plus 0.5 feet when located off roads or traveled ways. The maximum distance between manholes is proposed to be 400 feet. The elevations used for this preliminary design are based on 5-foot contours derived from digitized photogrammetry. Critical surface and invert elevations and slopes should be verified by field survey at the final design phase.

The force main from the proposed Indiantown Lift Station was sized at 6-inches in order to maintain the total dynamic head lower than the maximum rated head for the pump volute of 87 pounds per square inch. This results in acceptable but nominally slower than desirable velocity. The performance of that proposed force main should equal that of the existing Route 214 Lift Station which is the same size and currently has the same flow.

Pumping Stations. All sewage lift station pumps identified in this preliminary design are Gormann-Rupp T-3 Series suction lift pumps. These are the same make and model pumps installed in the other suction lift stations the tribe is currently operating. The rotational speed and motor horsepower varies with the head and flow conditions. The maximum pressure on the discharge side of the lift stations pumps is limited to 87 pounds per square inch, or 200 feet of head. Onsite emergency power generation capacity is proposed to ensure continuous operation under conditions of power outage. Each station is proposed to contain duplex pump configurations with each pump adequate to meet the design conditions. The pump control panels are proposed to allow for lead-lag pump operation.

The Elizabeth George Drive Lift Station will be replaced with a new facility equipped with suction lift pumps enclosed in a 14- by 20-foot pump house constructed of split face concrete block similar in appearance to the Pequot Trail Lift Station. This replacement station will be furnished with an 8-foot diameter wetwell and duplex Gormann-Rupp T3A-B suction lift pumps equipped with 10 horsepower motors rotating at 2,150 RPM. The hydraulic capacity of the station will be approximately 150 gallons per minute at 62 feet of head. Lead-lag pump operation with automatic lead pump alternating and alarms will be controlled by non-mercury float switches located in the wetwell. A 35-kilowatt Onan Model GGFD propane-fired emergency generator complete with an automatic transfer switch will also be housed in the lift station. Wastewater will be pumped from the replacement Elizabeth George Drive Lift Station through an 890-foot fusion-welded 4-inch high density polyethylene force main to the existing Manhole EP-22. The new force main will be located in the same trench as the existing 3-inch force main which will be abandoned.

b) Project Schedule. The tribe will submit all required NEPA and cultural rights documentation by January 2003. Because there are not any endangered plant or animal species or known cultural resources in the vicinity of the project, NEPA exclusion and cultural rights clearance will take approximately one month. The tribe will obtain necessary easements from abutting property owners and local and state jurisdictions within two months of project approval. The tribe proposes to advertise for bids in March 2003, award the contract in May 2003 and begin construction in June 2003. Construction is anticipated to take approximately three months, with final inspection and completion by September 2003. Operator training and initiation of operation will take place during the fall of 2003. Record drawings will be submitted by December 2003.

c) Permit Requirements. The first 2,000 linear feet of the proposed 8-inch gravity sewer collection line from the Hidden Acres site is located on fee land adjacent to the northern edge of the parcel identified on the Tribal Master Plan map as 151 Iron Street. Although formal easement is likely not required on this fee parcel, the on-site designer must be mindful of the requirement to preserve access to this line and five manholes that are proposed to be located on the 151 Iron Street parcel.

From the previously described parcel the line is proposed to enter a privately-owned parcel identified as 769 Shewville Road. Temporary construction and permanent maintenance easement will be required from the owners of this parcel for approximately 375 linear feet and one manhole.

From the previously described parcel the line is proposed gravity sewer line will cross Shewville Road. The Town of Ledyard owns this road and will require a building or trade permit, a public sewer permit, and right-of-way.

From the previously described parcel the line is proposed to enter Tribal fee land identified as the 770 Shewville site. Approximately 1,100 linear feet of gravity sewer line is proposed to be located on this site, and can be oriented such that the line and maintenance area lie completely on fee land. Although formal easement is likely not required on this fee parcel, the on-site designer must be mindful of the requirement to preserve access to this line and three manholes that are proposed to be located on the 770 Shewville parcel.

From the previously described parcel the line is proposed to enter a privately-owned parcel identified as 746 Shewville Road. Temporary construction and permanent maintenance easement will be required from the owners of this parcel for approximately 1,000 linear feet and three manholes.

From the previously described parcel the proposed gravity sewer line will cross Connecticut Route 214 which is also known as Indiantown Road at this location. The State of Connecticut owns this road and will require a Department of Transportation encroachment permit.

From the previously described parcel the line is proposed to enter Tribal fee land identified as the 38 Indiantown site. Approximately 1,000 linear feet of gravity sewer line is proposed to be located on this site, and can be oriented such that the line and maintenance area lie completely on fee land. Although formal easement is likely not required on this fee parcel, the on-site designer must be mindful of the requirement to preserve access to this line, three manholes, and the Indiantown Lift Station that are proposed to be located on the 38 Indiantown parcel.

Approximately 1,800 linear feet of gravity sewer collection line off-site of the Indiantown Road subdivision is located on Tribal fee land adjacent to the northeastern and northwestern edges of the parcel identified on the Tribal Master Plan map as 694 Shewville Road. The sewer line can be oriented such that the line and maintenance area lie completely on fee land. The proposed location of this line is also such that it skirts the 50-foot wetlands setback identified on the preliminary subdivision map. The sewer line between the proposed manhole identified as Manhole IT-2 and the proposed Indiantown Lift Station will however cross wetlands. A General Permit Authorization for Placement of Utilities Within Inland Wetlands and Stream Channel Encroachment Lines will be required from the Inland Water Resources Division of the Connecticut Department of Environmental Protection.

The first 2,900 linear feet of the force main from the proposed Indiantown Lift Station is located on the fee land identified as the 38 Indiantown site. The orientation is such that it lies completely within roads identified in the preliminary 38 Indiantown Road subdivision. Although formal easement is likely not required on this fee parcel, the on-site designer must be mindful of the requirement to preserve access to this line that is proposed to be located on the 38 Indiantown parcel. However, the location of a force main is typically quite flexible and if subsequent on-site design changes are made, the force main location can also be changed to ensure location within subdivision roads.

From the previously described parcel the proposed force main will cross Connecticut Route 214 which is also known as Indiantown Road at this location. The State of Connecticut owns this road and will require a Department of Transportation encroachment permit.

From the previously described parcel the proposed force main will enter Tribal trust land. Approximately 600 linear feet of force main is proposed to be located on this parcel, and can be oriented such that the line and maintenance area lie completely on the existing access road to the Elizabeth George Drive Lift Station.

The existing wastewater treatment plant is owned and operated by the tribe. The plant was upsized ten years ago and has sufficient capacity to handle the increased flows anticipated as a result of the proposed project. Permits will not be necessary for the increased flows to the plant.

d) Sustainability Considerations. Not examined for this project.

e) Total Project Cost Estimate (Engineer's Opinion of Probable Cost).

Table 7
Capital Cost Estimate
Recommended Alternative

Description	Subtotal Cost	Total Cost
Hidden Acres		
Gravity sewer, 2,400 LF @ $100/LF	$240,000	
Gravity manholes, 7 each @ $6,700/manhole (ave = 11.2 ft)	$46,900	
Ledge excavation, 2,200 CY @ $70/CY	$154,000	
Permits, easements, rights-of-way	$5,000	
Subtotal - Hidden Acres		$445,900
770 Shewville		
Gravity sewer; 3,150 LF @ $100/LF	$315,000	
Gravity manholes; 7 each @ $5,400/manhole (ave = 9.0 ft)	$37,800	
Ledge excavation, 3,200 CY @ $70/CY	$224,000	
Permits, easements, rights-of-way	$5,000	
Subtotal - 770 Shewville		$581,800
38 Indiantown Road		
Gravity sewer; 1,650 LF @ $100/LF	$165,000	
Gravity manholes; 6 each @ $5,500/manhole (ave = 9.2 ft)	$33,000	
Ledge excavation, trench (gravity); 1,500 CY @ $70/CY	$105,000	
Indiantown Lift Station		
Ledge excavation; 80 CY @ $40/CY	$3,200	
Foundation; LS	$10,000	
8-foot precast wetwell; LS	$21,000	
Superstructure, including finish; LS	$25,000	
Gormann-Rupp suction lift pump skid; LS	$62,000	
Onan propane-fired generator; LS	$45,000	
Electrical, complete; LS	$8,000	
Mechanical, complete; LS	$5,000	
Plumbing, complete; LS	$5,000	
Powerline extension; LS	$20,000	
6" HDPE sewer force main; 3,400 LF @ $35/LF	$119,000	
Force main manholes; 9 each @ $3,600/manhole (ave = 6.0 ft)	$32,400	
Ledge excavation, trench (force main); 1,700 CY @ $70/CY	$119,000	
Wetlands crossing; LS	$10,000	
Permits, easements, rights-of-way; LS	$5,000	
Subtotal - 38 Indiantown Road		$792,600
Upgrade to existing infrastructure		
Elizabeth George Drive Lift Station		

Ledge excavation; 80 CY @ $40/CY	$3,200	
Foundation; LS	$10,000	
8-foot precast wetwell; LS	$21,000	
Superstructure, including finish; LS	$25,000	
Gormann-Rupp suction lift pump skid, complete; LS	$30,000	
Onan propane-fired generator; LS	$30,000	
Electrical, complete; LS	$8,000	
Mechanical, complete; LS	$5,000	
Plumbing, complete; LS	$5,000	
4" HDPE sewer force main; 890 LF @ $32.50/LF	$28,925	
Ledge excavation, trench (force main); 100 CY @ $70/CY	$7,000	
Pequot Trail Lift Station		
Re-sheave pump and motors	$3,500	
Subtotal - Upgrade to existing infrastructure		$176,625
Total - offsite sewer facilities		$1,996,925
Engineering services		
Final design; LS @ 5% of total offsite	$99,800	
Bidding services; LS	$5,000	
Construction administration @ 1.5% of total	$30,000	
Project representative services, full time; 2000 hours@ $65/hour	$130,000	
Startup/operational phase services; LS	$5,000	
Subtotal - Engineering services		$269,800
Project Subtotal		$2,266,725
Contingency @ 15%		$340,000
Recommended Alternative Project Total		$2,606,725

f) Annual Operating Budget.

i) Income. Not examined for this project.

ii) Annual O&M Costs.

Table 8
Annual O&M Cost Estimate
Recommended Alternative

Category	Cost
Salaries/Benefits	$25,000
Office Supplies/Printing	$500
Insurance	$1,000
Fuel	$1,200
Electrical	$1,400
Chemical	$700
Analytical	$120
Maintenance/Repairs	$2,400
Professional Fees	$500
Miscellaneous	$2,000
Total	$34,820

Table 9

Schedule of Costs

Recommended Alternative

	Initial and One Time Costs ($)	Annual Recurring Costs ($)
Year	Scheduled Cost	Scheduled Cost
0	$2,606,725	
1		$34,820
2		$34,820
3		$34,820
4		$34,820
5		$34,820
6		$34,820
7		$34,820
8		$34,820
9		$34,820
10		$34,820
11		$34,820
12		$34,820
13		$34,820
14		$34,820
15	$12,000	$34,820
16		$34,820
17		$34,820
18		$34,820
19		$34,820
20		$34,820
21		$34,820
22		$34,820
23		$34,820
24		$34,820
25		$34,820
26		$34,820
27		$34,820
28		$34,820
29		$34,820
30	$12,000	$34,820
31		$34,820
32		$34,820
33		$34,820
34		$34,820
35		$34,820

iii) Debt Repayments. Not examined for this project.

iv) Reserves. Not examined for this project.

g) Operation and Maintenance Needs. The operators who currently operate the community wastewater system have the required certifications to operate and maintain the wastewater treatment plant and lift stations at the estimated future flow rates expected as a result of the housing developments.

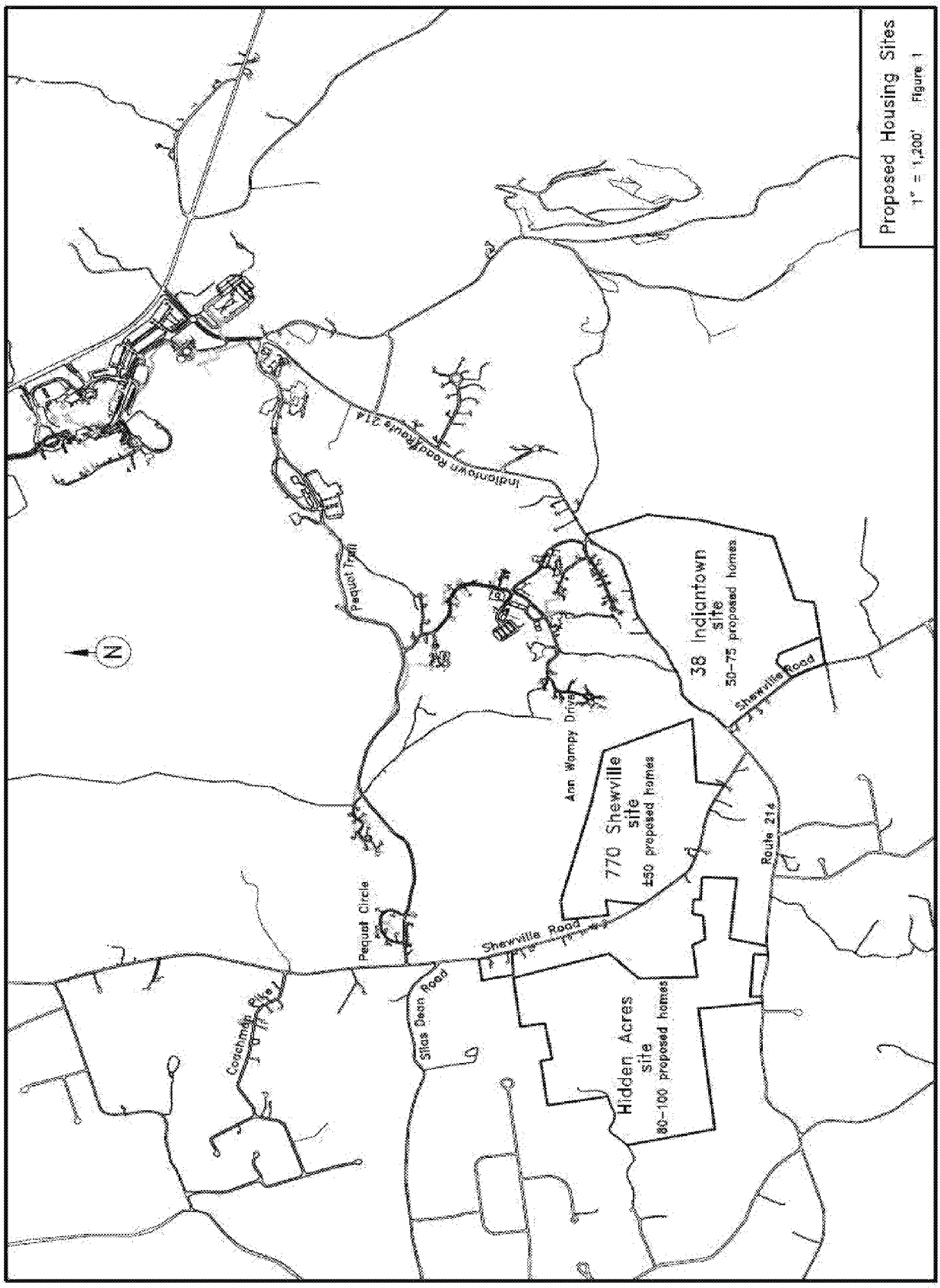
h) Environmental Assessment. The project will qualify for a categorical exclusion under NEPA. Due to the proximity of the project to a designated wetlands area, the tribe will obtain certification from the U.S. Army Corps of Engineers for construction of the utilities.

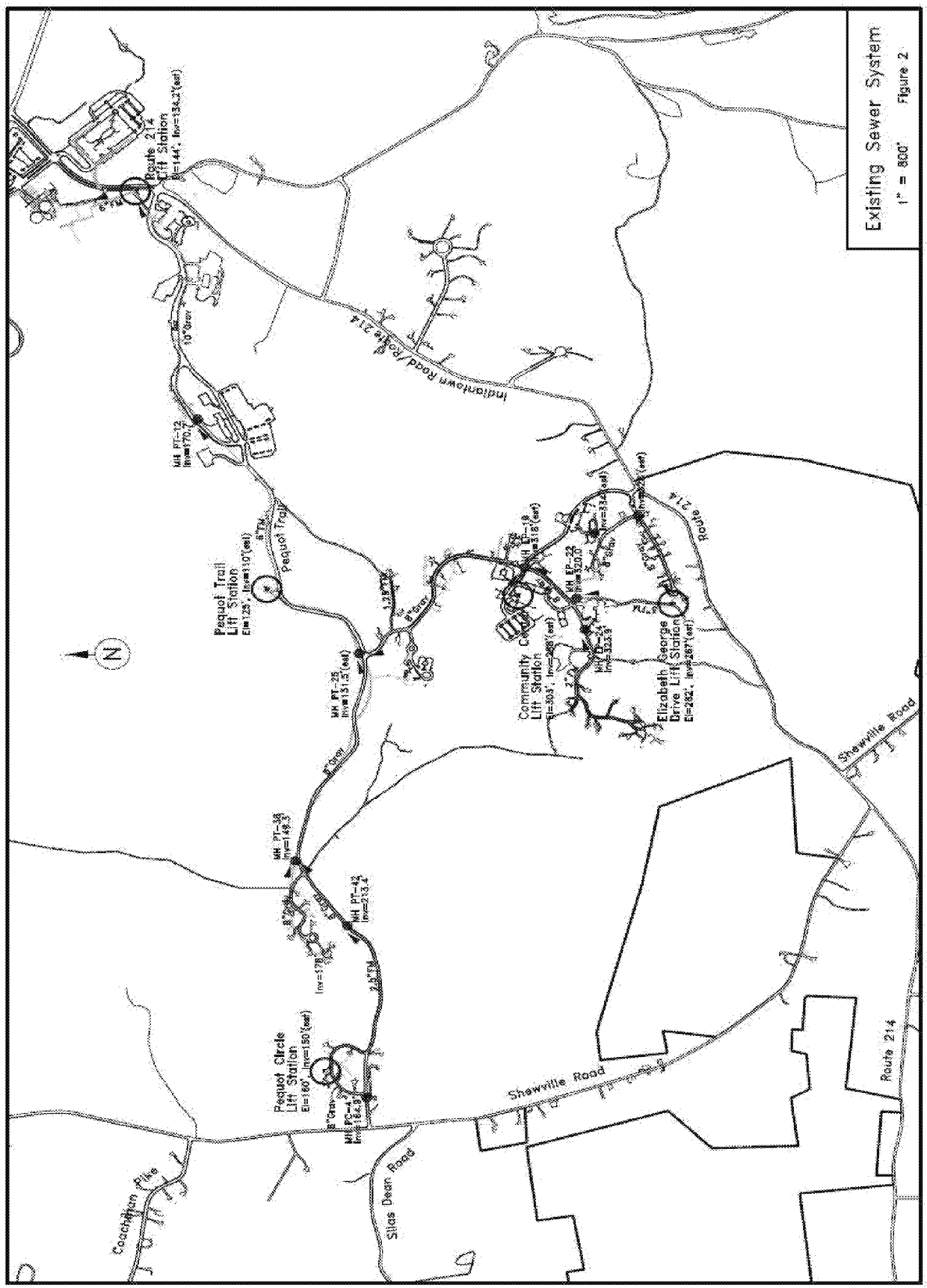
7.0 CONCLUSIONS AND RECOMMENDATIONS

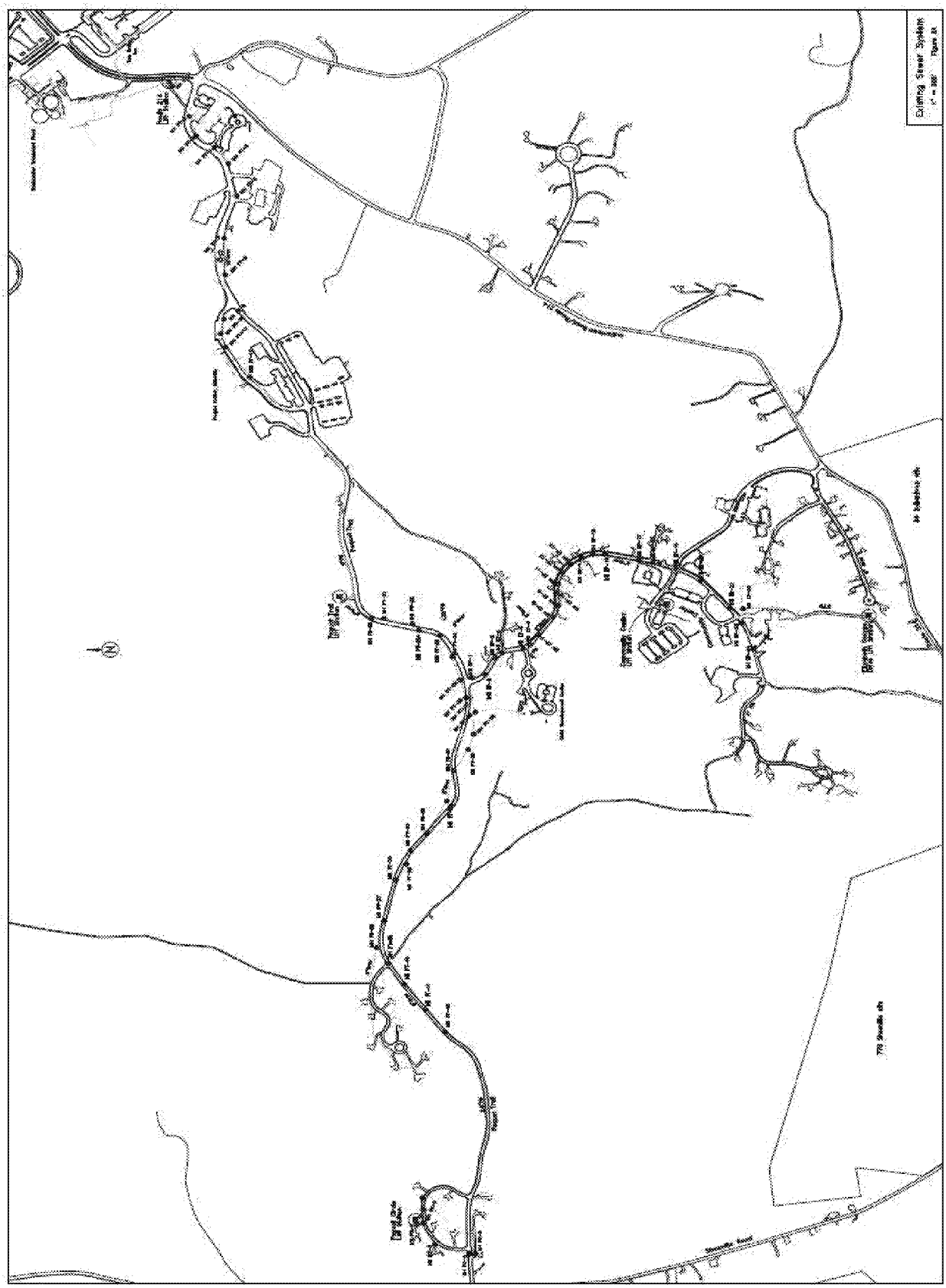
Although it does not appear that significant buried utilities are located within the project areas, notification to Dig Safe for a preconstruction survey and alignment marking of recorded utility easements is highly recommended.

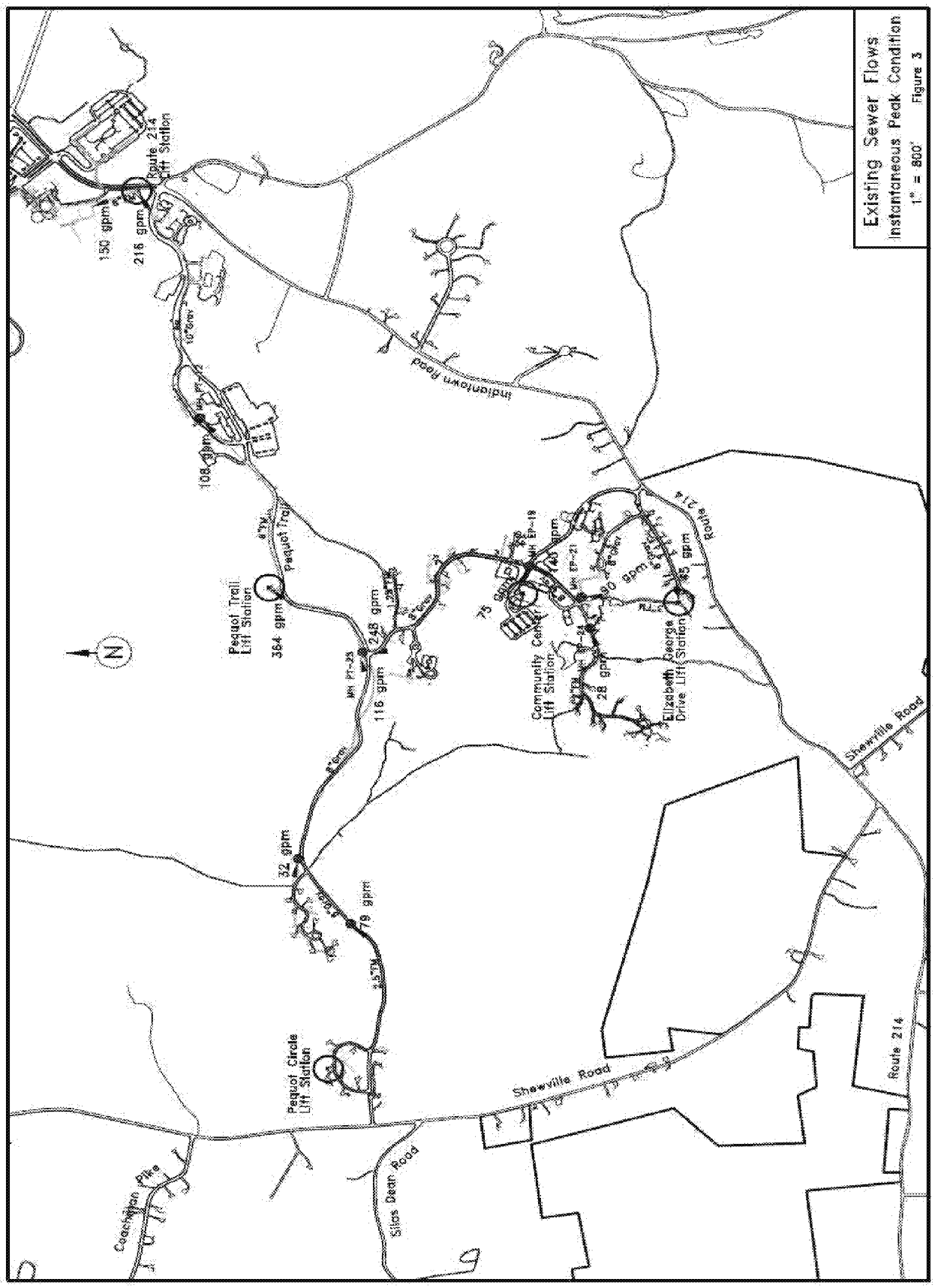
Trenching throughout the project and excavations for the proposed sewer lift stations is expected to encounter significant quantities of ledge. Conventional drilling and blasting techniques are proposed with appropriate safety practices in place. In addition to traffic and pedestrian control in the immediate areas, these include pre-blast and seismic surveys to document any potential damage arising from the ledge excavation.

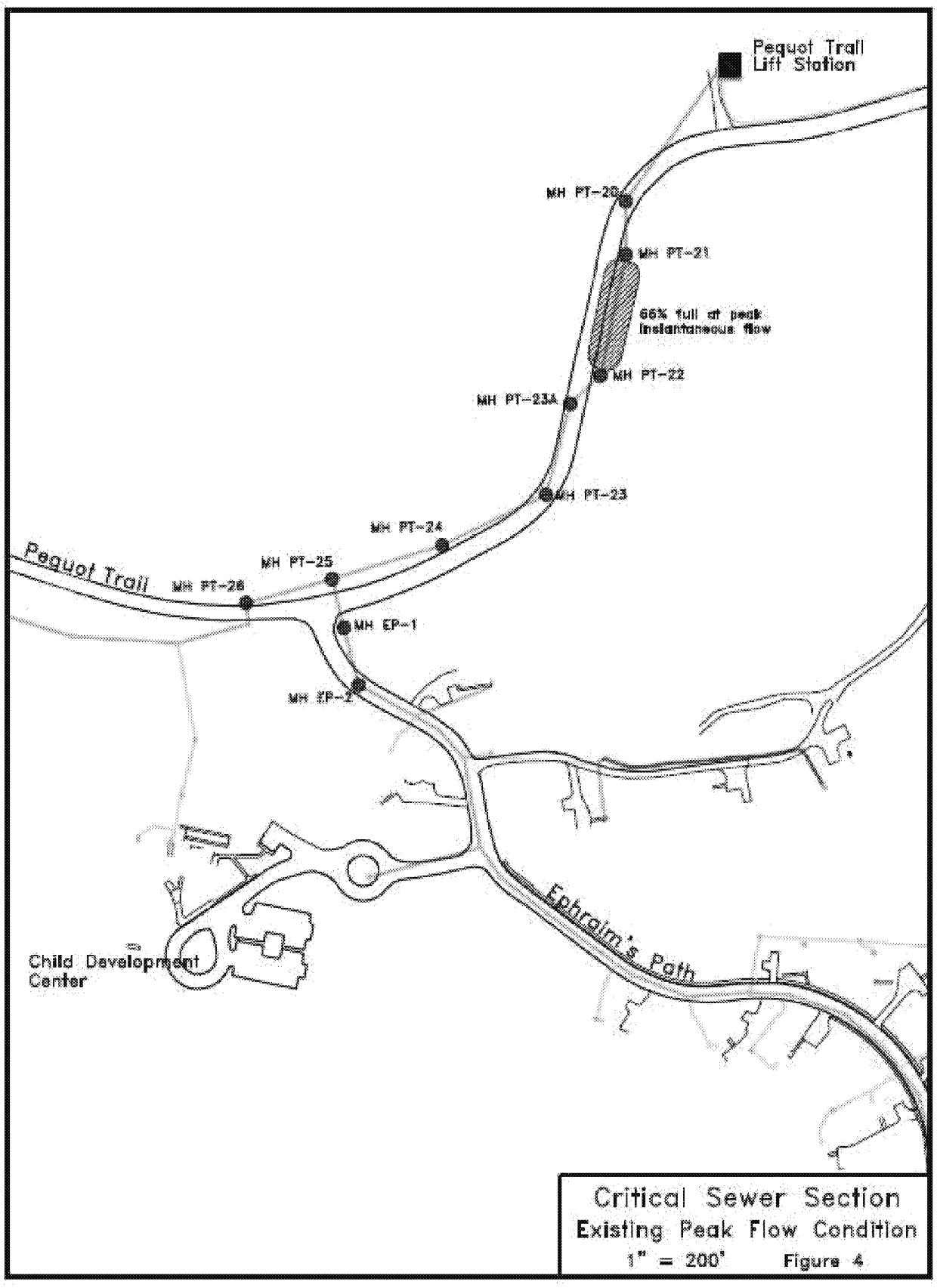
Depth to invert was measured by the tribe for the manholes in this section, but surveyed manhole rim elevations were not available. These elevations and slopes of these sewer sections should be confirmed in the early stages of the final design to verify the adequacy of these sections to accept additional flows.

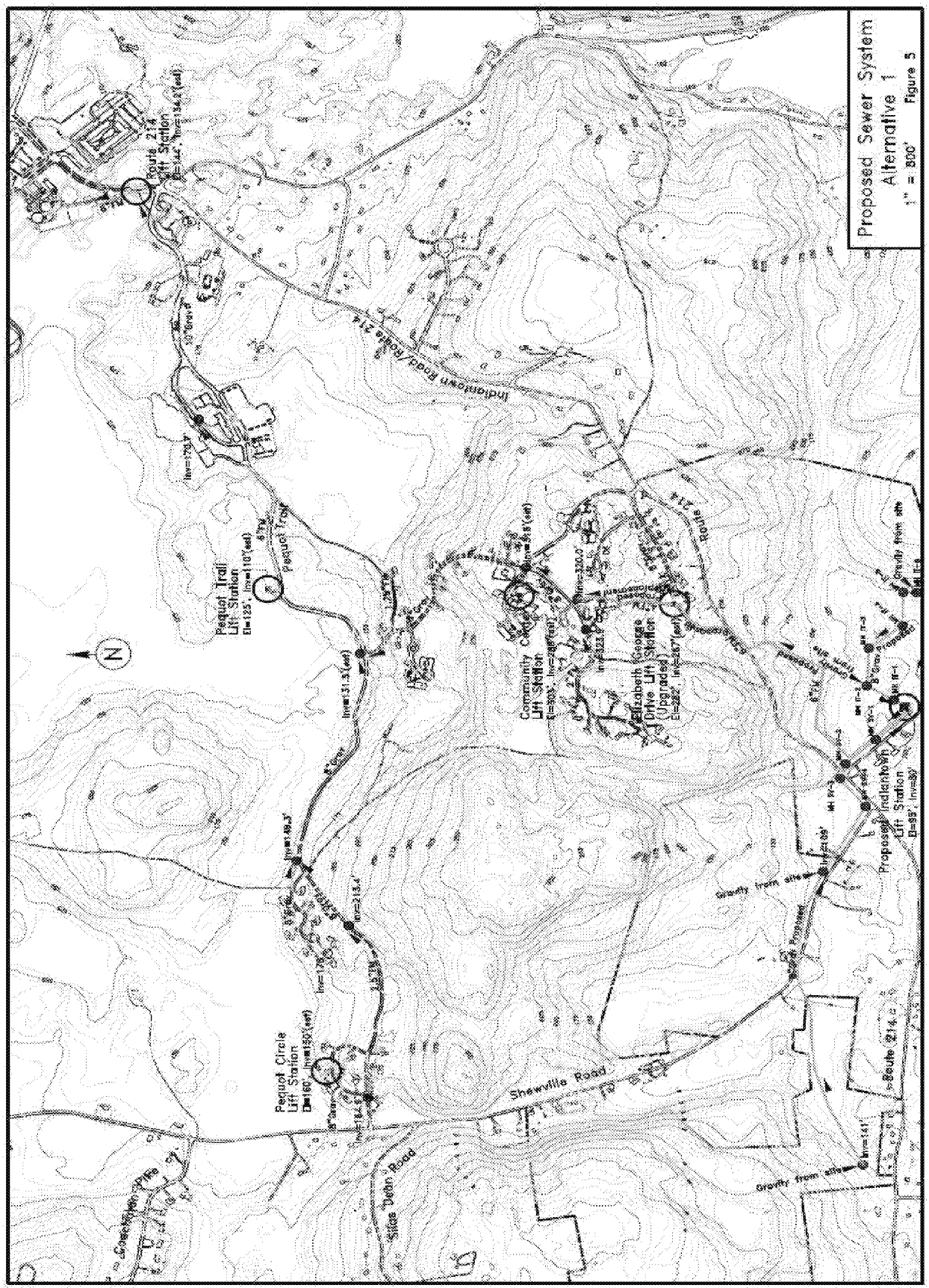


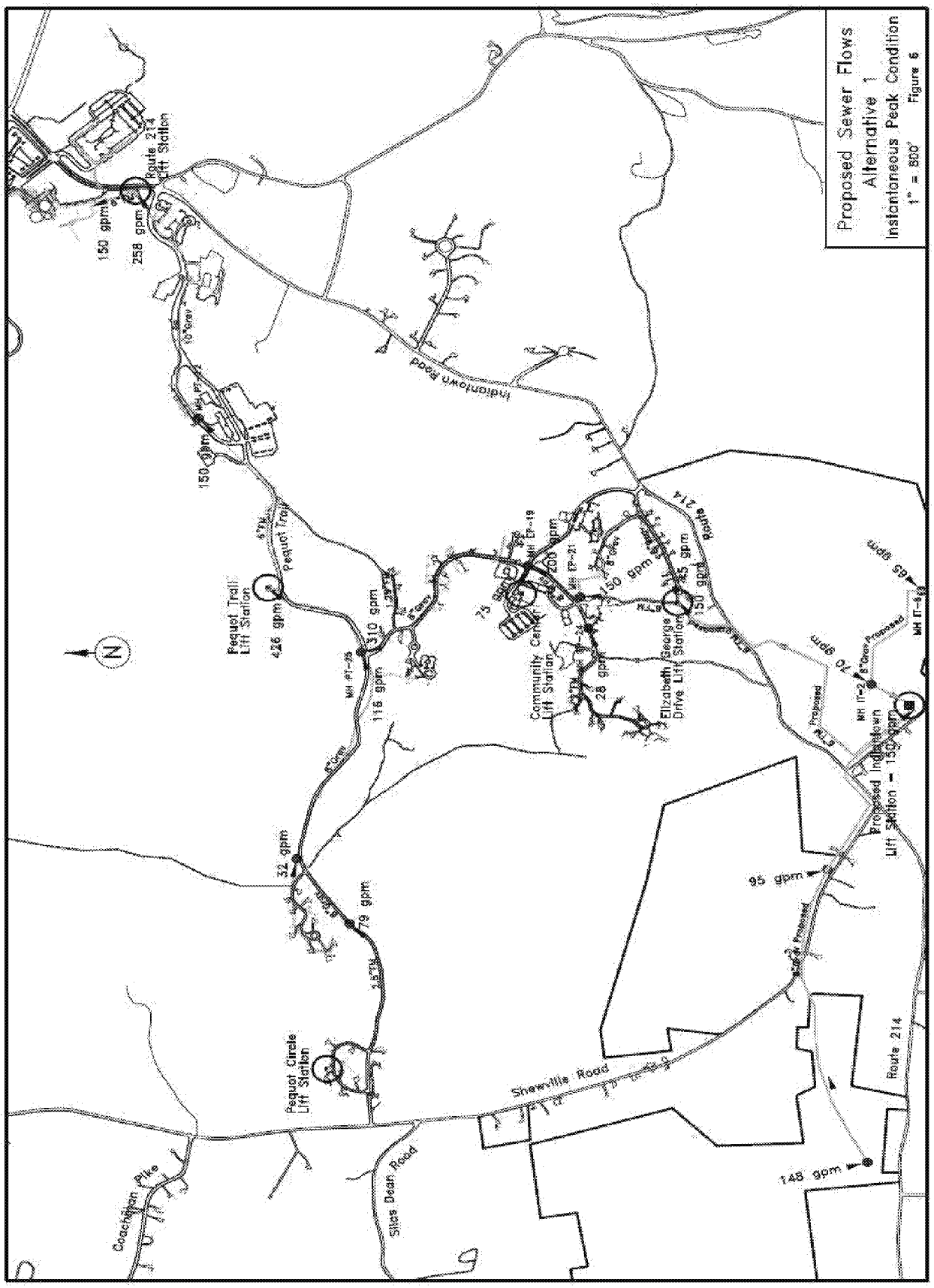


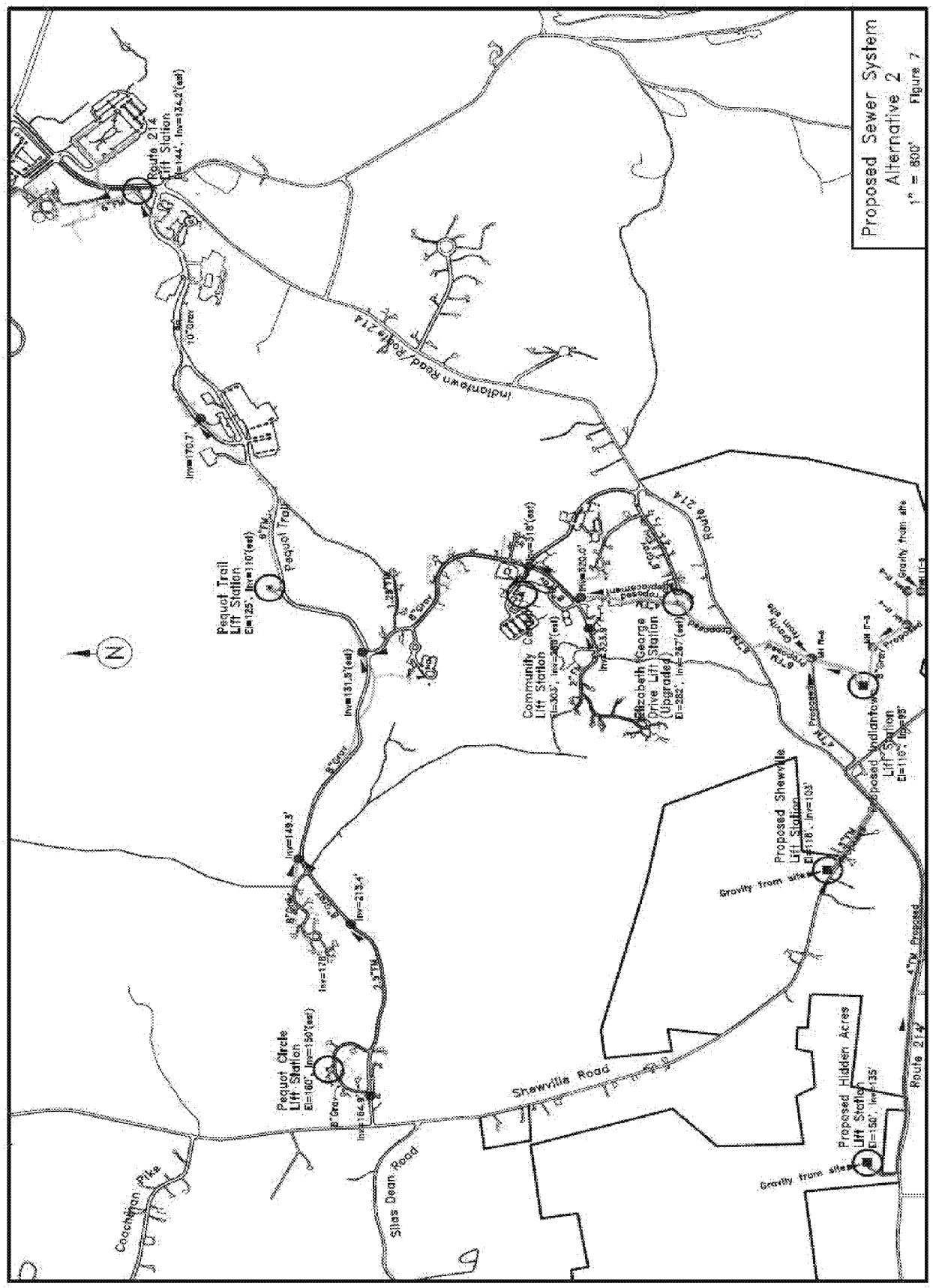


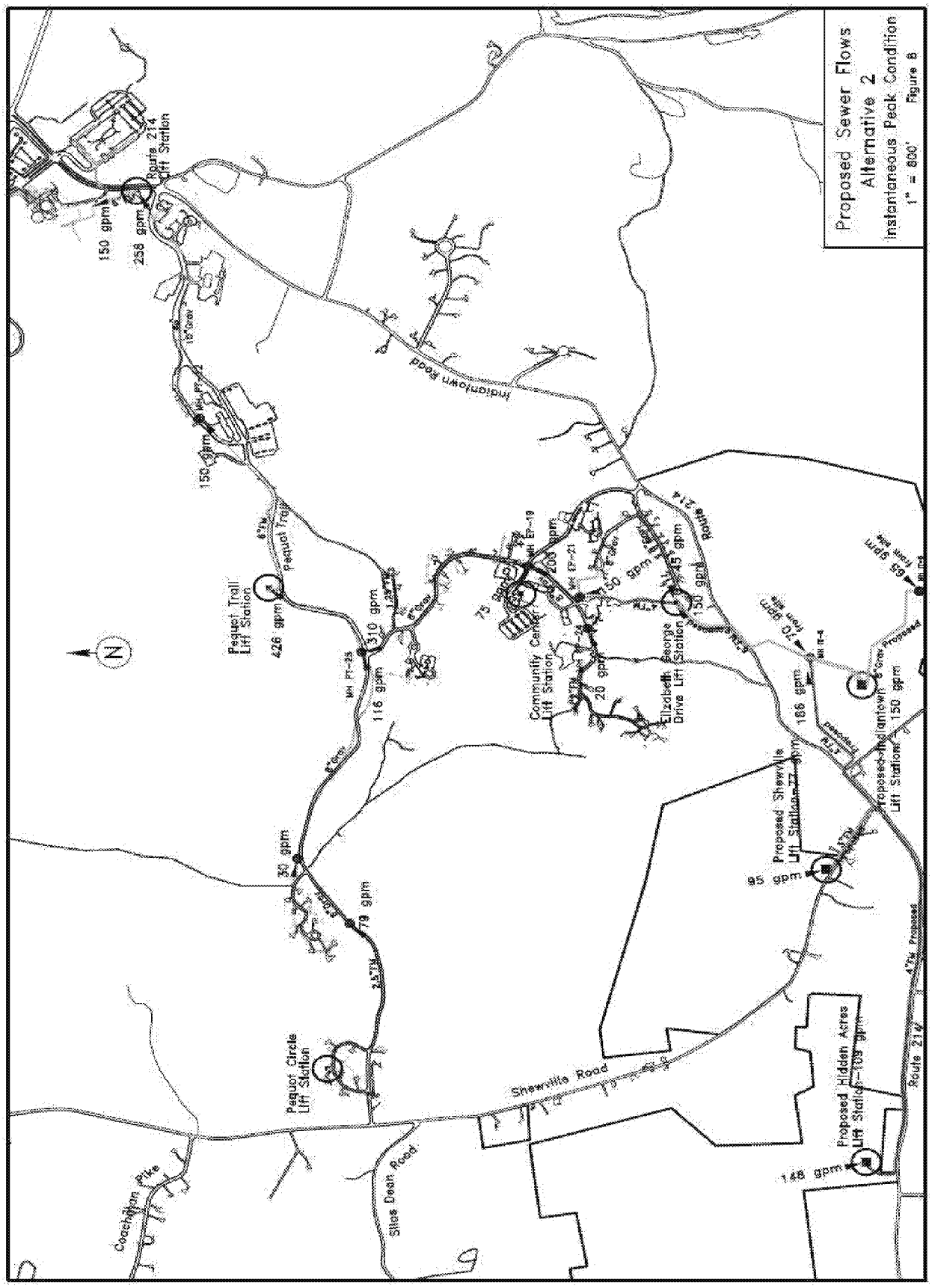


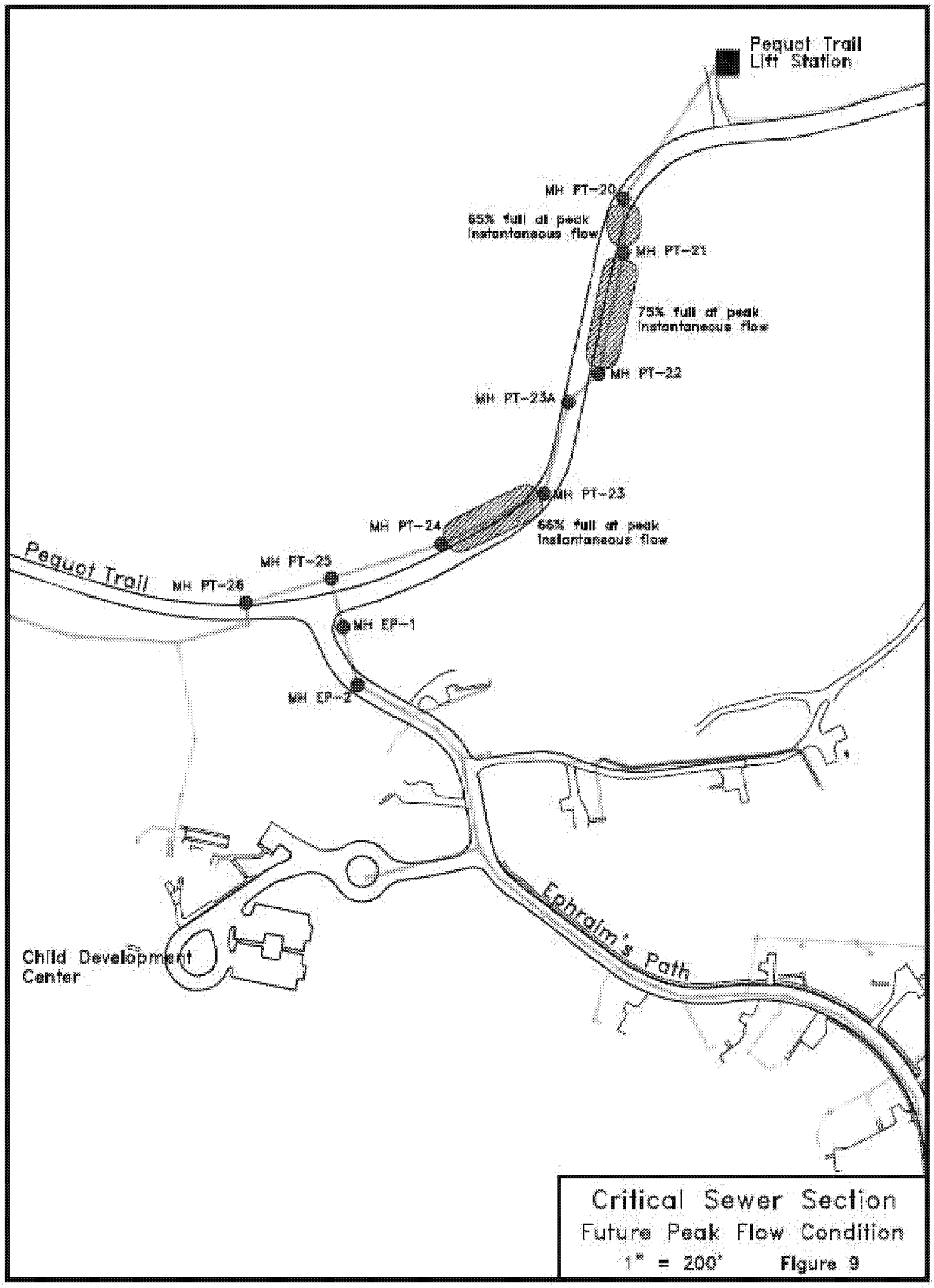












APPENDIX 12

ENGINEERING PROJECT REPORT (EPR)

REVIEW SHEET

Engineering Project Report Review - Project: _____

Are the following minimum deliverables included in this EPR?

EPR Component	Yes?
Executive summary that provides a concise review of the project objective, engineering efforts to date, and proposed project scope. **Comments:**	☐
Introduction & Project Background that includes tribal perspective, preliminary design objective and scope, a summary of Indian homes to receive benefit from the proposed project, and a description of the preliminary design development activities. **Comments:**	☐
Project Planning Section that includes maps and descriptions of the service area, population trends and projections, and a narrative of environmental resources that affect the design of the project. **Comments:**	☐
Detailed description of **existing water system facilities**. **Comments:**	☐
Detailed description of **existing wastewater system facilities**. **Comments:**	☐
Detailed description of **existing solid waste system facilities**. **Comments:**	☐
Description of **Need for Project**, including health, sanitation, and security, aging infrastructure, and future demands on infrastructure. **Comments:**	

Engineering Project Report Review - Project: _____

Are the following minimum deliverables included in this EPR?

EPR Component	Yes?
Description of Alternatives Considered, including design criteria, map, environmental impacts, land requirements, potential construction problems, cost estimates, life cycle cost analysis, and O&M costs. **Comments:**	☐
Selection of Alternative Section presented in table format to compare cost estimates, land requirements, life cycle costs, and other factors. **Comments:**	☐
Description of **Proposed Project (Recommended Alternative)**, including preliminary project design, project schedule, permit requirements, cost estimate, environmental assessment, and O&M needs. **Comments:**	☐
Conclusions and Recommendations Section. **Comments:**	☐

APPENDIX 13

INTERAGENCY

PRELIMINARY ENGINEERING REPORT

TEMPLATE

ABBREVIATIONS

NEPA – National Environmental Policy Act
NPV – Net Present Value
O&M – Operations and Maintenance
OMB – Office of Management and Budget
Report – Preliminary Engineering Report
SPPW – Single Payment Present Worth
USPW – Uniform Series Present Worth

GENERAL OUTLINE OF A PRELIMINARY ENGINEERING REPORT

3) PROJECT PLANNING
   a) Location
   b) Environmental Resources Present
   c) Population Trends
   d) Community Engagement

4) EXISTING FACILITIES
   a) Location Map
   b) History
   c) Condition of Existing Facilities
   d) Financial Status of any Existing Facilities
   e) Water/Energy/Waste Audits

5) NEED FOR PROJECT
   a) Health, Sanitation, and Security
   b) Aging Infrastructure
   c) Reasonable Growth

6) ALTERNATIVES CONSIDERED
   a) Description
   b) Design Criteria
   c) Map
   d) Environmental Impacts
   e) Land Requirements
   f) Potential Construction Problems
   g) Sustainability Considerations
      i) Water and Energy Efficiency
      ii) Green Infrastructure
      iii) Other
   h) Cost Estimates

7) SELECTION OF AN ALTERNATIVE
   a) Life Cycle Cost Analysis
   b) Non-Monetary Factors

8) PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)
   a) Preliminary Project Design
   b) Project Schedule
   c) Permit Requirements
   d) Sustainability Considerations
      i) Water and Energy Efficiency

ii) Green Infrastructure
iii) Other

e) Total Project Cost Estimate (Engineer's Opinion of Probable Cost)
f) Annual Operating Budget
   i) Income
   ii) Annual O&M Costs
   iii) Debt Repayments
   iv) Reserves

9) CONCLUSIONS AND RECOMMENDATIONS

DETAILED OUTLINE OF A PRELIMINARY ENGINEERING REPORT

1) PROJECT PLANNING

Describe the area under consideration. Service may be provided by a combination of central, cluster, and/or centrally managed individual facilities. The description should include information on the following:

a) Location. Provide scale maps and photographs of the project planning area and any existing service areas. Include legal and natural boundaries and a topographical map of the service area.

b) Environmental Resources Present. Provide maps, photographs, and/or a narrative description of environmental resources present in the project planning area that affect design of the project. Environmental review information that has already been developed to meet requirements of NEPA or a state equivalent review process can be used here.

c) Population Trends. Provide U.S. Census or other population data (including references) for the service area for at least the past two decades if available. Population projections for the project planning area and concentrated growth areas should be provided for the project design period. Base projections on historical records with justification from recognized sources.

d) Community Engagement: Describe the utility's approach used (or proposed for use) to engage the community in the project planning process. The project planning process should help the community develop an understanding of the need for the project, the utility operational service levels required, funding and revenue strategies to meet these requirements, along with other considerations.

2) EXISTING FACILITIES

Describe each part (e.g. processing unit) of the existing facility and include the following information:

a) Location Map. Provide a map and a schematic process layout of all existing facilities. Identify facilities that are no longer in use or abandoned. Include photographs of existing facilities.

b) History. Indicate when major system components were constructed, renovated, expanded, or removed from service. Discuss any component failures and the cause for the failure. Provide a history of any applicable violations of regulatory requirements.

c) Condition of Existing Facilities. Describe present condition; suitability for continued use; adequacy of current facilities; and their conveyance, treatment, storage, and disposal capabilities. Describe the existing capacity of each component. Describe and reference compliance with applicable federal, state, and

local laws. Include a brief analysis of overall current energy consumption. Reference an asset management plan if applicable.

d) Financial Status of any Existing Facilities. (Note: Some agencies require the owner to submit the most recent audit or financial statement as part of the application package.) Provide information regarding current rate schedules, annual O&M cost (with a breakout of current energy costs), other capital improvement programs, and tabulation of users by monthly usage categories for the most recent typical fiscal year. Give status of existing debts and required reserve accounts.

e) Water/Energy/Waste Audits. If applicable to the project, discuss any water, energy, and/or waste audits which have been conducted and the main outcomes.

3) NEED FOR PROJECT

Describe the needs in the following order of priority:

a) Health, Sanitation, and Security. Describe concerns and include relevant regulations and correspondence from/to federal and state regulatory agencies. Include copies of such correspondence as an attachment to the Report.

b) Aging Infrastructure. Describe the concerns and indicate those with the greatest impact. Describe water loss, inflow and infiltration, treatment or storage needs, management adequacy, inefficient designs, and other problems. Describe any safety concerns.

c) Reasonable Growth. Describe the reasonable growth capacity that is necessary to meet needs during the planning period. Facilities proposed to be constructed to meet future growth needs should generally be supported by additional revenues. Consideration should be given to designing for phased capacity increases. Provide number of new customers committed to this project.

4) ALTERNATIVES CONSIDERED

This section should contain a description of the alternatives that were considered in planning a solution to meet the identified needs. Documentation of alternatives considered is often a Report weakness. Alternative approaches to ownership and management, system design (including resource efficient or green alternatives), and sharing of services, including various forms of partnerships, should be considered. In addition, the following alternatives should be considered, if practicable: building new centralized facilities, optimizing the current facilities (no construction), developing centrally managed decentralized systems, including small cluster or individual systems, and developing an optimum combination of centralized and decentralized systems. Alternatives should be consistent with those considered in the NEPA, or state equivalent, environmental review. Technically infeasible alternatives that were considered should be mentioned briefly along with an explanation of why they are infeasible, but do not require full analysis. For each technically feasible alternative, the description should include the following information:

a) Description. Describe the facilities associated with every technically feasible alternative. Describe source, conveyance, treatment, storage and distribution facilities for each alternative. A feasible system may include a combination of centralized and decentralized (on-site or cluster) facilities.

b) Design Criteria. State the design parameters used for evaluation purposes. These parameters should comply with federal, state, and agency design policies and regulatory requirements.

c) Map. Provide a schematic layout map to scale and a process diagram if applicable. If applicable, include future expansion of the facility.

d) Environmental Impacts. Provide information about how the specific alternative may impact the environment. Describe only those unique direct and indirect impacts on floodplains, wetlands, other important land resources, endangered species, historical and archaeological properties, etc., as they relate to each specific alternative evaluated. Include generation and management of residuals and wastes.

e) Land Requirements. Identify sites and easements required. Further specify whether these properties are currently owned, to be acquired, leased, or have access agreements.

f) Potential Construction Problems. Discuss concerns such as subsurface rock, high water table, limited access, existing resource or site impairment, or other conditions which may affect cost of construction or operation of facility.

g) Sustainability Considerations. Sustainable utility management practices include environmental, social, and economic benefits that aid in creating a resilient utility.

   i) Water and Energy Efficiency. Discuss water reuse, water efficiency, water conservation, energy efficient design (i.e. reduction in electrical demand), and/or renewable generation of energy, and/or minimization of carbon footprint, if applicable to the alternative. Alternatively, discuss the water and energy usage for this option as compared to other alternatives.

   ii) Green Infrastructure. Discuss aspects of project that preserve or mimic natural processes to manage stormwater, if applicable to the alternative. Address management of runoff volume and peak flows through infiltration, evapotranspiration, and/or harvest and use, if applicable.

   iii) Other. Discuss any other aspects of sustainability (such as resiliency or operational simplicity) that are incorporated into the alternative, if applicable.

h) Cost Estimates. Provide cost estimates for each alternative, including a breakdown of the following costs associated with the project: construction, non-construction, and annual O&M costs. A construction contingency should be included as a non-construction cost. Cost estimates should be included with the descriptions of each technically feasible alternative. O&M costs should include a rough breakdown by O&M category (see example below) and not just a value for each alternative. Information from other sources, such as the recipient's accountant or other known technical service providers, can be incorporated to assist in the development of this section. The cost derived will be used in the life cycle cost analysis described in Section 5 a.

Example O&M Cost Estimate	
Personnel (i.e. Salary, Benefits, Payroll Tax, Insurance, Training)	
Administrative Costs (e.g. office supplies, printing, etc.)	
Water Purchase or Waste Treatment Costs	
Insurance	
Energy Cost (Fuel and/or Electrical)	
Process Chemical	
Monitoring & Testing	
Short Lived Asset Maintenance/Replacement*	
Professional Services	
Residuals Disposal	
Miscellaneous	
Total	

* See Appendix A for example list

5) SELECTION OF AN ALTERNATIVE

Selection of an alternative is the process by which data from the previous section, "Alternatives Considered" is analyzed in a systematic manner to identify a recommended alternative. The analysis should include consideration of both life cycle costs and non-monetary factors (i.e. triple bottom line analysis: financial, social, and environmental). If water reuse or conservation, energy efficient design, and/or renewable generation of energy components are included in the proposal provide an explanation of their cost effectiveness in this section.

a) Life Cycle Cost Analysis. A life cycle present worth cost analysis (an engineering economics technique to evaluate present and future costs for comparison of alternatives) should be completed to compare the technically feasible alternatives. Do not leave out alternatives because of anticipated costs; let the life cycle cost analysis show whether an alternative may have an acceptable cost. This analysis should meet the following requirements and should be repeated for each technically feasible alternative. Several analyses may be required if the project has different aspects, such as one analysis for different types of collection systems and another for different types of treatment.

11. The analysis should convert all costs to present day dollars;
12. The planning period to be used is recommended to be 20 years, but may be any period determined reasonable by the engineer and concurred on by the state or federal agency;
13. The discount rate to be used should be the "real" discount rate taken from Appendix C of OMB circular A-94 and found at (www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html);

14. The total capital cost (construction plus non-construction costs) should be included;
15. Annual O&M costs should be converted to present day dollars using a uniform series present worth (USPW) calculation;
16. The salvage value of the constructed project should be estimated using the anticipated life expectancy of the constructed items using straight line depreciation calculated at the end of the planning period and converted to present day dollars;
17. The present worth of the salvage value should be subtracted from the present worth costs;
18. The net present value (NPV) is then calculated for each technically feasible alternative as the sum of the capital cost (C) plus the present worth of the uniform series of annual O&M (USPW (O&M)) costs minus the single payment present worth of the salvage value (SPPW(S)):

$$NPV = C + USPW\ (O\&M) - SPPW\ (S)$$

19. A table showing the capital cost, annual O&M cost, salvage value, present worth of each of these values, and the NPV should be developed for state or federal agency review. All factors (major and minor components), discount rates, and planning periods used should be shown within the table.
20. Short lived asset costs (See Appendix A for examples) should also be included in the life cycle cost analysis if determined appropriate by the consulting engineer or agency. Life cycles of short lived assets should be tailored to the facilities being constructed and be based on generally accepted design life. Different features in the system may have varied life cycles.

b) Non-Monetary Factors. Non-monetary factors, including social and environmental aspects (e.g. sustainability considerations, operator training requirements, permit issues, community objections, reduction of greenhouse gas emissions, wetland relocation) should also be considered in determining which alternative is recommended and may be factored into the calculations.

6) PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)

The engineer should include a recommendation for which alternative(s) should be implemented. This section should contain a fully developed description of the proposed project based on the preliminary description under the evaluation of alternatives. Include a schematic for any treatment processes, a layout of the system, and a location map of the proposed facilities. At least the following information should be included as applicable to the specific project:

a) Preliminary Project Design.

i) Drinking Water:

Water Supply. Include requirements for quality and quantity. Describe recommended source, including site and allocation allowed.

Treatment. Describe process in detail (including whether adding, replacing, or rehabilitating a process) and identify location of plant and site of any process discharges. Identify capacity of treatment plant (i.e. Maximum Daily Demand).

Storage. Identify size, type and location.

Pumping Stations. Identify size, type, location and any special power requirements. For rehabilitation projects, include description of components upgraded.

Distribution Layout. Identify general location of new pipe, replacement, or rehabilitation: lengths, sizes and key components.

ii) Wastewater/Reuse:

Collection System/Reclaimed Water System Layout. Identify general location of new pipe, replacement or rehabilitation: lengths, sizes, and key components.

Pumping Stations. Identify size, type, site location, and any special power requirements. For rehabilitation projects, include description of components upgraded.

Storage. Identify size, type, location and frequency of operation.

Treatment. Describe process in detail (including whether adding, replacing, or rehabilitating a process) and identify location of any treatment units and site of any discharges (end use for reclaimed water). Identify capacity of treatment plant (i.e. Average Daily Flow).

iii) Solid Waste:

Collection. Describe process in detail and identify quantities of material (in both volume and weight), length of transport, location and type of transfer facilities, and any special handling requirements.

Storage. If any, describe capacity, type, and site location.

Processing. If any, describe capacity, type, and site location.

Disposal. Describe process in detail and identify permit requirements, quantities of material, recycling processes, location of plant, and site of any process discharges.

iv) Stormwater:

Collection System Layout. Identify general location of new pipe, replacement or rehabilitation: lengths, sizes, and key components.

Pumping Stations. Identify size, type, location, and any special power requirements.

Treatment. Describe treatment process in detail. Identify location of treatment facilities and process discharges. Capacity of treatment process should also be addressed.

Storage. Identify size, type, location and frequency of operation.

Disposal. Describe type of disposal facilities and location.

Green Infrastructure. Provide the following information for green infrastructure alternatives:

- Control Measures Selected. Identify types of control measures selected (e.g., vegetated areas, planter boxes, permeable pavement, rainwater cisterns).
- Layout: Identify placement of green infrastructure control measures, flow paths, and drainage area for each control measure.
- Sizing: Identify surface area and water storage volume for each green infrastructure control measure. Where applicable, soil infiltration rate, evapotranspiration rate, and use rate (for rainwater harvesting) should also be addressed.
- Overflow: Describe overflow structures and locations for conveyance of larger precipitation events.

b) Project Schedule. Identify proposed dates for submittal and anticipated approval of all required documents, land and easement acquisition, permit applications, advertisement for bids, loan closing, contract award, initiation of construction, substantial completion, final completion, and initiation of operation.

c) Permit Requirements. Identify any construction, discharge and capacity permits that will/may be required as a result of the project.

d) Sustainability Considerations (if applicable).

i) Water and Energy Efficiency. Describe aspects of the proposed project addressing water reuse, water efficiency, and water conservation, energy efficient design, and/or renewable generation of energy, if incorporated into the selected alternative.

ii) Green Infrastructure. Describe aspects of project that preserve or mimic natural processes to manage stormwater, if applicable to the selected alternative. Address management of runoff volume and peak flows through infiltration, evapotranspiration, and/or harvest and use, if applicable.

iii) Other. Describe other aspects of sustainability (such as resiliency or operational simplicity) that are incorporated into the selected alternative, if incorporated into the selected alternative.

e) Total Project Cost Estimate (Engineer's Opinion of Probable Cost). Provide an itemized estimate of the project cost based on the stated period of construction. Include construction, land and rights-of-way, legal, engineering, construction program management, funds administration, interest, equipment, construction

contingency, refinancing, and other costs associated with the proposed project. The construction subtotal should be separated out from the non-construction costs. The non-construction subtotal should be included and added to the construction subtotal to establish the total project cost. An appropriate construction contingency should be added as part of the non-construction subtotal. For projects containing both water and waste disposal systems, provide a separate cost estimate for each system as well as a grand total. If applicable, the cost estimate should be itemized to reflect cost sharing including apportionment between funding sources. The engineer may rely on the owner for estimates of cost for items other than construction, equipment, and engineering.

f) Annual Operating Budget. Provide itemized annual operating budget information. The owner has primary responsibility for the annual operating budget, however, there are other parties that may provide technical assistance. This information will be used to evaluate the financial capacity of the system. The engineer will incorporate information from the owner's accountant and other known technical service providers.

i) Income. Provide information about all sources of income for the system including a proposed rate schedule. Project income realistically for existing and proposed new users separately, based on existing user billings, water treatment contracts, and other sources of income. In the absence of historic data or other reliable information, for budget purposes, base water use on 100 gallons per capita per day. Water use per residential connection may then be calculated based on the most recent U.S. Census, American Community Survey, or other data for the state or county of the average household size. When large agricultural or commercial users are projected, the Report should identify those users and include facts to substantiate such projections and evaluate the impact of such users on the economic viability of the project.

ii) Annual O&M Costs. Provide an itemized list by expense category and project costs realistically. Provide projected costs for operating the system as improved. In the absence of other reliable data, base on actual costs of other existing facilities of similar size and complexity. Include facts in the Report to substantiate O&M cost estimates. Include personnel costs, administrative costs, water purchase or treatment costs, accounting and auditing fees, legal fees, interest, utilities, energy costs, insurance, annual repairs and maintenance, monitoring and testing, supplies, chemicals, residuals disposal, office supplies, printing, professional services, and miscellaneous as applicable. Any income from renewable energy generation which is sold back to the electric utility should also be included, if applicable. If applicable, note the operator grade needed.

iii) Debt Repayments. Describe existing and proposed financing with the estimated amount of annual debt repayments from all sources. All estimates of funding should be based on loans, not grants.

iv) Reserves. Describe the existing and proposed loan obligation reserve requirements for the following:

Debt Service Reserve – For specific debt service reserve requirements consult with individual funding sources. If General Obligation bonds are

proposed to be used as loan security, this section may be omitted, but this should be clearly stated if it is the case.

Short-Lived Asset Reserve – A table of short lived assets should be included for the system (See Appendix A for examples). The table should include the asset, the expected year of replacement, and the anticipated cost of each. Prepare a recommended annual reserve deposit to fund replacement of short-lived assets, such as pumps, paint, and small equipment. Short-lived assets include those items not covered under O&M, however, this does not include facilities such as a water tank or treatment facility replacement that are usually funded with long-term capital financing.

7. CONCLUSIONS AND RECOMMENDATIONS

Provide any additional findings and recommendations that should be considered in development of the project. This may include recommendations for special studies, highlighting of the need for special coordination, a recommended plan of action to expedite project development, and any other necessary considerations.

Interagency PER Appendix A: Example List of Short-Lived Asset Infrastructure

Estimated Repair, Rehab, Replacement Expenses by Item within up to 20 Years from Installation)	
Drinking Water Utilities	**Wastewater Utilities**
Source Related	**Treatment Related**
Pumps	Pump
Pump Controls	Pump Controls
Pump Motors	Pump Motors
Telemetry	Chemical feed pumps
Intake/ Well screens	Membrane Filters Fibers
Water Level Sensors	Field & Process Instrumentation Equipment
Pressure Transducers	UV lamps
Treatment Related	Centrifuges
Chemical feed pumps	Aeration blowers
Altitude Valves	Aeration diffusers and nozzles
Valve Actuators	Trickling filters, RBCs, etc.
Field & Process Instrumentation Equipment	Belt presses & driers
Granular filter media	Sludge Collecting and Dewatering Equipment
Air compressors & control units	Level Sensors
Pumps	Pressure Transducers
Pump Motors	Pump Controls
Pump Controls	Back-up power generator
Water Level Sensors	Chemical Leak Detection Equipment
Pressure Transducers	Flow meters
Sludge Collection & Dewatering	SCADA Systems
UV Lamps	**Collection System Related**
Membranes	Pump
Back-up power generators	Pump Controls
Chemical Leak Detection Equipment	Pump Motors
Flow meters	Trash racks/bar screens
SCADA Systems	Sewer line rodding equipment
Distribution System Related	Air compressors
Residential and Small Commercial Meters	Vaults, lids, and access hatches
Meter boxes	Security devices and fencing
Hydrants & Blow offs	Alarms & Telemetry
Pressure reducing valves	Chemical Leak Detection Equipment
Cross connection control devices	
Altitude valves	
Alarms & Telemetry	
Vaults, lids, and access hatches	
Security devices and fencing	
Storage reservoir painting/patching	

APPENDIX 14

COMMUNITY SYSTEM MASTER PLAN (CSMP)

REVIEW SHEET

Community System Master Plan Review - Project: _____

Are the following minimum deliverables included in this CSMP?

CSMP Component	Yes?
General community **background** information. **Comments:**	☐
The **condition and capacity** of existing infrastructure. **Comments:**	☐
Overall **sanitation deficiencies**. **Comments:**	☐
Identification of **existing population, flows, quantities, and/or demands**. **Comments:**	☐
Current service areas. **Comments:**	☐
Estimates of **future population, flows, quantities, and/or demands**. **Comments:**	☐
Future service areas. **Comments:**	☐

Community System Master Plan Review - Project: _____

Are the following minimum deliverables included in this CSMP?

CSMP Component	Yes?
Capital improvement needs. **Comments:**	☐
General environmental requirements for capital improvement projects. **Comments:**	☐
Assessment of the operation and maintenance organization. **Comments:**	☐
Operation and maintenance improvement plan. **Comments:**	☐

APPENDIX 15

PROJECT SUMMARY BASED ON EPR

TEMPLATE

PROJECT SUMMARY

[PROJECT NAME]
[TRIBE NAME]
[STATE]

IHS PROJECT
XX-##-XXX

PUBLIC LAW 86-121

Prepared By:

_____ _____
[NAME] Date
[TITLE]

Reviewed By:

_____ _____
[NAME] Date
District Engineer
[NAME] District Office

Approved By:

_____ _____
[NAME] Date
Director, Division of Sanitation Facilities Construction
[NAME] Area Indian Health Service

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
INDIAN HEALTH SERVICE
[NAME] AREA OFFICE
OFFICE OF ENVIRONMENTAL HEALTH AND ENGINEERING

PROJECT SUMMARY
[PROJECT NAME]
[TRIBE NAME]
[STATE]

PUBLIC LAW 86-121
IHS PROJECT
XX-##-XXX

[PROJECT NAME] is described below and in the attached Engineering Project Report entitled "[REPORT NAME]". This Project Summary defines the project scope and is comprised of the following sections.

Section	Described below	Included in EPR
Introduction	☐	☐
Existing Sanitation Facilities	☐	☐
Recommended Facilities	☐	☐
Alternatives	☐	☐
Homes Served	☐	☐
Operations and Maintenance Considerations	☐	☐
Environmental Review	☐	☐
Cost Estimate	☐	☐
Project Schedule	☐	☐
Summary of Funding by Source	☐	☐

INTRODUCTION

Criteria for the Sanitation Facilities Construction Program - Jun 99, page 8-2:
"1. An introduction that references the project request and includes adequate information for determining that a proposed project qualifies for funding, in accordance with IHS authorities, policies, and procedures."

In a Project Proposal dated [DATE], the [TRIBE] acting through [TRIBAL OFFICIAL NAME] and [TITLE], requested Indian Health Service (IHS) assistance under the provisions of P.L. 86-121 to [OBJECTIVE]. This project will serve homes in the [COMMUNITY NAME] community.

Specifically, this project proposes to [GENERAL SCOPE].

The cost to the IHS to provide the recommended facilities is estimated to be [TOTAL COST].

EXISTING SANITATION FACILITIES

Criteria for the Sanitation Facilities Construction Program - Jun 99, page 8-2:
"2. Description of the existing sanitation facilities, including the number and type of homes served."

Water System

Wastewater System

Solid Waste

RECOMMENDED FACILITIES

Criteria for the Sanitation Facilities Construction Program - Jun 99, page 8-2:
"3. Description of the recommended sanitation facilities with brief discussions of reasonable alternatives considered and the number and type of homes to be served by the project."

Water System

Wastewater System

Solid Waste

ALTERNATIVES

Water System

Wastewater System

Solid Waste

HOMES SERVED

[Homes served table from Homes tab in PDS]

OPERATIONS AND MAINTENACE CONSIDERATIONS

Criteria for the Sanitation Facilities Construction Program - Jun 99, page 8-2:
"4. Identify the O&M organization and O&M responsibilities including estimated costs, funding sources, and homeowner costs."

Technical assistance will be available from the IHS to develop a formal rate structure and operational plan to make the water and wastewater utility programs self-supporting.

ENVIRONMENTAL REVIEW

Criteria for the Sanitation Facilities Construction Program - Jun 99, page 8-2:
"5. A brief paragraph stating that an environmental review was performed in accordance with the environmental review requirements in the IHS Environmental Review Manual. The paragraph should include the conclusion or determination of that review. The environmental review should be attached as appropriate to the Project Summary. If an environmental review was not performed, briefly state the reasons why a review was not done."

An environmental review will be prepared and a determination of compliance will be made prior to construction. Also prior to construction, the tribe will review all proposed sites for archeological clearance and to ensure no proposed homes served are located within established flood plain areas.

COST ESTIMATE

Criteria for the Sanitation Facilities Construction Program - Jun 99, page 8-2:
"6. Detailed engineering cost estimate of the proposed project and a project implementation schedule. At minimum, the project schedule should include the proposed start date, completion date of construction, and the project completion date. The format of the project schedule is decided by the Area SFC program."

[Line item cost estimate]

PROJECT SCHEDULE

The proposed project schedule is summarized below.

[Proposed milestones dates table from the milestones tab in PDS]

SUMMERY OF FUNDING BY SOURCE

Criteria for the Sanitation Facilities Construction Program - Jun 99, page 8-2:
"7. Funding sources and amounts by source."

All funding will be as summarized below. No other monetary contributions are anticipated for facilities constructed under this project.

[Estimated funding table from the funding tab in PDS]

APPENDIX 16

PROJECT SUMMARY BASED ON EPR

EXAMPLE

PROJECT SUMMARY

LITTLE DAM PUMPHOUSE AND WATER MAIN EXTENSION
NAMBE INDIAN RESERVATION
NEW MEXICO

IHS PROJECT
AL-11-114

PUBLIC LAW 86-121

Prepared By:

Christen P. Glime, P.E.
District Engineer
Santa Fe District Office

3/28/2011
Date

Reviewed & Approved By:

Ernestine L. Meyers
Acting Director
Sanitation Facilities Construction Branch
Albuquerque Area Indian Health Service

3/28/2011
Date

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
INDIAN HEALTH SERVICE
ALBUQUERQUE AREA OFFICE
OFFICE OF ENVIRONMENTAL HEALTH AND ENGINEERING

PROJECT SUMMARY
LITTLE DAM PUMPHOUSE AND WATER MAIN EXTENSION
NAMBE INDIAN RESERVATION
NEW MEXICO

PUBLIC LAW 86-121
IHS PROJECT
AL-11-114

The LITTLE DAM PUMPHOUSE AND WATER MAIN EXTENSION is described below and in the attached Engineering Project Report entitled "LITTLE DAM PUMPHOUSE AND WATER MAIN EXTENSION, SDS NM26306-1201". This Project Summary defines the project scope and is comprised of the following sections.

Section	Described below	Included in EPR
Introduction	☑	☑
Existing Sanitation Facilities	☐	☑
Recommended Facilities	☐	☑
Alternatives	☐	☑
Homes Served	☐	☑
Operations and Maintenance Considerations	☑	☑
Environmental Review	☑	☐
Cost Estimate	☑	☐
Project Schedule	☑	☐
Summary of Funding by Source	☑	☐

INTRODUCTION

In a Project Proposal dated February 11, 2011, the Nambe Pueblo acting through the Governor, requested Indian Health Service (IHS) assistance under the provisions of P.L. 86-121 to construct a pumphouse and water main extension to place the Little Dam Production Well into service.

This project is described in the attached Engineering Project Report (EPR).

The cost to the IHS to provide the recommended facilities is estimated to be $800,000.

EXISTING SANITATION FACILITIES

See attached Engineering Project Report (EPR).

RECOMMENDED FACILITIES

See attached Engineering Project Report (EPR).

ALTERNATIVES

See attached Engineering Project Report (EPR).

HOMES SERVED

See attached Engineering Project Report (EPR).

OPERATIONS AND MAINTENACE CONSIDERATIONS

See attached Engineering Project Report (EPR).

Technical assistance will be available from the IHS to develop a formal rate structure and operational plan to make the water and wastewater utility programs self-supporting.

ENVIRONMENTAL REVIEW

An environmental review will be prepared and a determination of compliance will be made prior to construction. Also prior to construction, the Indian Health Service will review the project area for archeological clearance, will work with an archaeologist to obtain an archaeological review of the project site as required, and to ensure no proposed homes served are located within established flood plain areas.

PROJECT SCHEDULE

Milestone	Estimated Completion Date
Memorandum of Agreement (MOA) Signed	April 1, 2011
Construction Start	October 1, 2011
Construction Complete	March 1, 2012
Transfer Agreement Signed	July 1, 2012

SUMMERY OF FUNDING BY SOURCE

The EPA will provide $800,000 for this project.

COST ESTIMATE

Nambe Pumphouse & Water Main Extension					
I.H.S. Project AL 11-114					
Cost Estimate					
SCHEDULE A - WATER FACILITIES					
Item	**Description**	**Quantity**	**Units**	**Units Cost**	**Total**
1	Pumphouse	1	L.S.	$ 325,000.00	$325,000.00
2	8" PVC Water Main	12400	L.F.	$ 30.00	$372,000.00
3	Connection to Existing Water Main	4	EA	$ 3,000.00	$12,000.00
4	Arroyo Crossings (8 total) w/ 8" DI Water Main	1050	LF	$ 100.00	$105,000.00
5	Air/Vacuum Release Valves	8	EA	$ 3,000.00	$24,000.00
6	8" Gate Valves	15	EA	$ 2,500.00	$37,500.00
7	Mobilization	1	LS	$ 35,000.00	$35,000.00
				Schedule A Subtotal =	$910,500.00
				NMGRT (6.625%)=	$60,500.00
				Construction Contingencies =	$92,000.00
				Subtotal (Construction + Contingencies + NMGRT) =	**$1,063,000.00**
				Construction Funds Available from AL 08-896 =	$385,000.00
				Construction Funding from AL 11-114 =	**$678,000.00**
				I.H.S. Project Technical Support =	$68,000.00
				I.H.S. Engineering (~ 7% - USDA Table II) =	$48,000.00
				Subtotal (I.H.S. PTS + Engineering) =	**$116,000.00**
				Geotechnical Investigation =	$6,000.00
				TOTAL PROJECT COST =	**$800,000.00**

Amount to be Transferred to the Project Account: $800,000.00

I.H.S. Eligible Homes =	114
I.H.S. Ineligible Homes =	128
Total # of Homes =	242
Cost Per Home =	$3,306

APPENDIX 17

CSI MasterFormat Specifications

Most Area SFC programs currently use standard specifications although some use technical provisions. The specifications or technical provision must describe the design generally and the products and execution specifically. Unless the Area has a specific format to specify construction the Construction Specifications Institute (CSI) MasterFormat is recommended. MasterFormat 1995 is the 16-division format typically used by SFC project managers and is recommended for use on SFC projects. MasterFormat 2004 and 2011 contain 49 and 48 divisions respectively and are acceptable alternatives when CSI specifications are used.

Divisions 0 or 00 of the MasterFormat 1995 and 2004/2011 respectively provide the procurement and contracting requirements for a construction project. Divisions 1 or 01 of those versions provide the general requirements for a construction project. The Engineers Joint Contract Documents Committee (EJCDC) agreement is recommended for the contract agreement when the method of work requires such a document. Other formats including the FAR bidding and contracting documents include the same basic clauses and provisions. Divisions 0 and 1 are typically called the "front end documents", and these may include the following sections.

Division 0 – Bidding & Contracting Requirements
00105 Invitation to Bid
00200 Instructions to Bidders
00300 Information Available to Bidders
00412 Bid Form - Unit Price
00430 Bid Form Supplements
00433 Bid Bond
00434 Statement of AI/AN Owned Enterprise
00505 Agreement (EJCDC Agreement)
00510 Notice of Award
00521 Agreement
00550 Notice to Proceed
00610 Performance Bond
00615 Payment Bond
00620 Contractor's Application for Payment
00625 Certification of Substantial Completion
00705 General Conditions (EJCDC Standard General Conditions)
00710 Standard General Conditions
00815 Supplementary Conditions
00825 Labor
00910 Addenda
00940 Work Change Directive
00941 Change Order
00942 Field Order

Division 1 – General Requirements
01100 Summary
01200 Price & Payment Procedures
01300 Administrative Requirements
01330 Submittal Procedures
01340 Contract Progress Schedule
01400 Quality Requirements
01500 Temporary Facilities & Controls
01560 Stormwater Controls
01600 Product Requirements
01700 Execution Requirements

Depending on the method of work selected for a specific project, additional contract documents may be required. This is particularly true where federal contracting will be used. The Federal Acquisition Regulation (FAR) has specific requirements that may require additional documents.

The project team will be responsible for developing these additional documents in conjunction with the federal or tribal contracting officer (CO).

The MasterFormat 1995 technical specifications are listed in Divisions 2 through 16 and include these divisions.

Division 2 – Site Construction
Division 3 – Concrete
Division 4 – Masonry
Division 5 – Metals
Division 6 – Wood and Plastics
Division 7 – Thermal and Moisture Protection
Division 8 – Doors and Windows
Division 9 – Finishes
Division 10 – Specialties
Division 11 – Equipment
Division 12 – Furnishings
Division 13 – Special Construction
Division 14 – Conveying Systems
Division 15 – Mechanical
Division 16 – Electrical

For most SFC construction projects the majority of the technical specifications will be under Division 2. This division includes excavation, backfilling, water main, and sewer main. The Engineering Project Report will ideally identify sizes, types, and performance standards for construction, equipment and materials. The EPR may also identify specific specifications to include in the construction document specification section. Certain technology and vendor products change over time and consequently care should be used when translating EPR specifications into the final construction documents to ensure that up to date specification information is used.

Regardless of the format of the drawings and specifications, the construction documents package must provide enough detail to fully bid and construct the designed project. The construction documents provide the administrative, technical and procurement language governing the project construction. As a result, the drawing and specification documents together must provide a complete description of the methods and desired end product.

APPENDIX 18

PRE-BID CONFERENCE CHECKLIST

For large, complex, or politically sensitive projects, the project manager may recommend a pre-bid conference and/or site visit during as part of solicitation activities. When a pre-bid conference is desired, this must be included in the construction documents to ensure that any party interested in the bidding process have equal opportunity to attend. The construction documents must also indicate if the pre-bid conference is mandatory or optional for prospective bidders.

Typically, the pre-bid conference is held at the project site and conducted by the contracting officer or project manager. Invitees will include the prospective bidders, contracting officer, appropriate tribal personnel, project manager and construction inspectors, other funding agencies, tribal environmental personnel, and state or local agencies. A pre-bid conference may be applicable regardless of the method of work, including force account work, although the topics may vary depending on the method of work. It should be emphasized that the purpose of the meeting is not to change the contract or scope.

The objective of the pre-bid conference is the following.

- To provide an opportunity for contractors and builders to visit the project site,
- To allow prospective bidders to inquire or clarify the scope of work,
- To allow prospective bidders to ask questions about contracting procedures or other aspects of the proposed construction and/or contract.

Items typically discussed at the pre-bid conference include the following.

1. Bid as required by the construction documents. Changes require an amendment.
2. Project construction documents.
3. Description of the project.
4. Location of the project site.
5. Bid dates, due dates, and where to send bid.
6. Documents required for a complete bid.
7. Amendments or changes.
8. Bid bonding.
9. Payment and performance bonding.
10. Davis Bacon wage rates requirements.
11. Tribal Employment Rights & Ordinances (TERO).
12. Payment process.
13. Unusual specifications or submittal requirements.
14. Liquidated damages.
15. Range of contract: <$25,000, $100,000 - $250,000, $250,000 - $500,000

To avoid unfair bid competition, certain topics should not be discussed at the pre-bid conference. These include:

1. Project engineer's estimated cost.
2. Changes to the specifications (unless there is a formal amendment).
3. Any insinuations or promises.

The checklist template on the following pages includes recommended pre-bid conference topics. The template can also serve as a written agenda and record of the conference discussion. Conference notes distributed to all participants and maintained in the project file are vital to the process.

Pre-bid Conference Checklist and Notes
Project XX-##-XXX
DATE
LOCATION

Item	**Responsible**
1. ☐ Bid as required by the construction documents. Changes require an amendment.	
Comments & actions required	
2. ☐ Project construction documents.	
Comments & actions required	
3. ☐ Description of the project.	
Comments & actions required	
4. ☐ Location of the project site.	
Comments & actions required	
5. ☐ Bid dates, due dates, and where to send bid.	
Comments & actions required	
6. ☐ Documents required for a complete bid.	
Comments & actions required	
7. ☐ Amendments or changes.	
Comments & actions required	
8. ☐ Bid bonding.	

Pre-bid Conference Checklist and Notes
Project XX-##-XXX
DATE
LOCATION

Item	**Responsible**
Comments & actions required	
9. ☐ Payment and performance bonding.	
Comments & actions required	
10. ☐ Davis Bacon wage rates requirements.	
Comments & actions required	
11. ☐ Tribal Employment Rights & Ordinances (TERO).	
Comments & actions required	
12. ☐ Payment process.	
Comments & actions required	
13. ☐ Unusual specifications or submittal requirements.	
Comments & actions required	
14. ☐ Liquidated damages.	
Comments & actions required	
15. ☐ Range of contract: <$25,000, $100,000 - $250,000, $250,000 - $500,000	
Comments & actions required	

Pre-bid Conference Checklist and Notes
Project XX-##-XXX
DATE
LOCATION

Item	**Responsible**

16. ☐	Other	
Comments & actions required		

Pre-bid Conference - Participants Project XX-##-XXX DATE LOCATION				
Name	Organization	Address	Phone Number	Email Address

APPENDIX 19

PRECONSTRUCTION CONFERENCE CHECKLIST

Some form of preconstruction conference is recommended for every SFC project, although the scope and specificity of the meeting will vary with project size, complexity, and method of work. The communication plan that was reviewed during construction planning will include the requirements for the preconstruction conference.

The preconstruction conference will minimally include representatives from the contracting office or tribe, IHS, builder and/or contractor as appropriate depending on the method of work. In some cases additional representatives may include sub-contractors, other funding agencies, environmental personnel, and state or local agencies. It should be emphasized that the purpose of the meeting is not to change the contract or scope. The objective of the conference is the following.

- ∞ Ensure that all participants have a clear and mutual understanding of all contract, technical, and construction requirements,
- ∞ Ensure that all parties understand their roles and responsibilities during the construction phase,
- ∞ Identify and resolve potential administrative problems,
- ∞ Establish the identity and responsibilities of representatives of both parties.

The checklist template on the following pages includes recommended preconstruction meeting topics. The template can also serve as a written agenda and record of the meeting discussion. Meeting notes distributed to all participants and maintained in the project file are vital to the process.

Items typically discussed at the preconstruction conference include the following.

1. Notice of award date.
2. Payment and performance bonds.
3. Evidence of insurance.
4. Notice to Proceed date.
5. Contract is between the Federal Government or Tribe (owner) and the contractor. For MOA Tribal procurement, the IHS is to provide oversight and technical assistance only.
6. Owner representative.
7. Contractor's foreman and/or lead representative.
8. IHS representative.
9. IHS primary inspector.
10. Inspections. Performed for the benefit of the Tribe and IHS and do not relieve the contractor from responsibility for quality control.
11. Fixed price contract based on bid schedule unit prices and quantities.
12. TERO rules and regulations.
13. Liquidated damages amount per day.
14. Contract duration.
15. Contractor's schedule.
16. Differing site conditions and change orders, work change directive, and field order.
17. Permits required.
18. Normal hours of work 8AM to 5PM, Monday-Friday and not on holidays.
19. One-year warranty.
20. Davis Bacon wages.
21. Submit payroll to tribe/or IHS weekly.
22. Pay requests submittal process. Payments made monthly.

23. For MOA Tribal procurement, pay advances comply with project specific MOA clauses and MOA Guidelines.
24. Subcontractors: Names and compliance with contract clauses.
25. Subcontract Amount: Prime contractors will be required to perform 33.3 percent of the work using their employees and equipment.
26. Safety Strategy issues identified in previous project phase(s).
27. Federal OSHA regulations apply to project. Identify builder/contractor's competent person.

Preconstruction Conference Checklist and Notes
Project XX-##-XXX
DATE
LOCATION

Item	**Responsible**
1. ☐ Notice of award date	
Comments & actions required	
2. ☐ Payment and performance bonds	
Comments & actions required	
3. ☐ Evidence of insurance	
Comments & actions required	
4. ☐ Notice to Proceed date	
Comments & actions required	
5. ☐ Parties to the contract	
Comments & actions required	
6. ☐ Owner's representative and role	
Comments & actions required	
7. ☐ Contractor's foreman and/or lead representative and role	
Comments & actions required	
8. ☐ IHS representative and role	

Preconstruction Conference Checklist and Notes
Project XX-##-XXX
DATE
LOCATION

Item	**Responsible**
Comments & actions required	
9. ☐ IHS primary inspector.	
Comments & actions required	
10. ☐ Submittals and schedule for submittals	
Comments & actions required	
11. ☐ Schedule of values	
Comments & actions required	
12. ☐ Performance review and schedule	
Comments & actions required	
13. ☐ Inspections. Performed for the benefit of the tribe and IHS and do not relieve the contractor from responsibility for quality control.	
Comments & actions required	
14. ☐ Fixed price contract based on bid schedule unit prices and quantities.	
Comments & actions required	
15. ☐ TERO rules and regulations.	
Comments & actions required	

Preconstruction Conference Checklist and Notes
Project XX-##-XXX
DATE
LOCATION

Item	Responsible
16. ☐ Liquidated damages amount per day.	
Comments & actions required	
17. ☐ Contract duration.	
Comments & actions required	
18. ☐ Contractor's schedule and progress reporting.	
Comments & actions required	
19. ☐ Differing site conditions and change orders, work change directive, and field order.	
Comments & actions required	
20. ☐ Permits required.	
Comments & actions required	
21. ☐ Normal hours of work 8AM to 5PM, Monday-Friday and not on holidays.	
Comments & actions required	
22. ☐ One-year warranty.	
Comments & actions required	

Preconstruction Conference Checklist and Notes
Project XX-##-XXX
DATE
LOCATION

Item	Responsible
23. ☐ Davis Bacon wages.	
Comments & actions required	
24. ☐ Submit payroll to tribe/or IHS weekly.	
Comments & actions required	
25. ☐ Pay requests submittal process. Payments made monthly.	
Comments & actions required	
26. ☐ For tribal procurement, pay advances comply with project specific MOA clauses and MOA Guidelines.	
Comments & actions required	
27. ☐ Subcontractors: Names and compliance with contract clauses.	
Comments & actions required	
28. ☐ Subcontract Amount: Prime contractors will be required to perform 33.3 percent of the work using their employees and equipment.	
Comments & actions required	
29. ☐ Safety Strategy issues identified in previous project phase(s).	
Comments & actions required	

Preconstruction Conference Checklist and Notes
Project XX-##-XXX
DATE
LOCATION

Item		**Responsible**
30. ☐	Federal OSHA regulations apply to project. Identify builder/contractor's competent person.	
Comments & actions required		

31. ☐	Other	
Comments & actions required		

Preconstruction Conference - Participants Project XX-##-XXX DATE LOCATION				
Name	Organization	Address	Phone Number	Email Address

APPENDIX 20

MICROSOFT® PROJECT

THE PMPro TOOL

MS Project Interface (April 2010)

Through the National DSFC Strategic Planning Initiative, a process has been established to interface Milestone dates between Microsoft Project (MS Project) and PDS. The interface allows project managers to use MS Project as a project management tool outside of STARS, and to upload Milestone dates into PDS without having to update independently in PDS. The intent of using an interface with commercial software in lieu of programming directly in STARS was due to availability and familiarity of commercial software, and the added features of the software for project management. The use of this feature is relatively easy to implement and could be used by all engineers using MS Project.

The Milestone names and numerical codes used for establishing the interface were provided by HQ in June 2009. These Milestones and codes are required in all files that will be uploaded into PDS and must be assigned as a "custom field" value in MS Project. Template files have been developed which contain these Milestones and codes in a "custom field" lookup table. These templates can be utilized for new MS Project files, or the lookup table from a template can be imported into existing MS Project files.

The following is to provide guidance on the use of this interface feature.

Using an MS Project Template File for uploading to PDS

MS Project Template files have been developed that contain the assigned Custom Field Milestones and numeric codes to all STARS Milestones. These templates can be used for developing new MS Project files and then be uploaded to PDS. The template files are located in the DSFC Library. One template file contains all of the STARS Milestones and one contains only the required HQ Milestones that must be reported. The file names are:

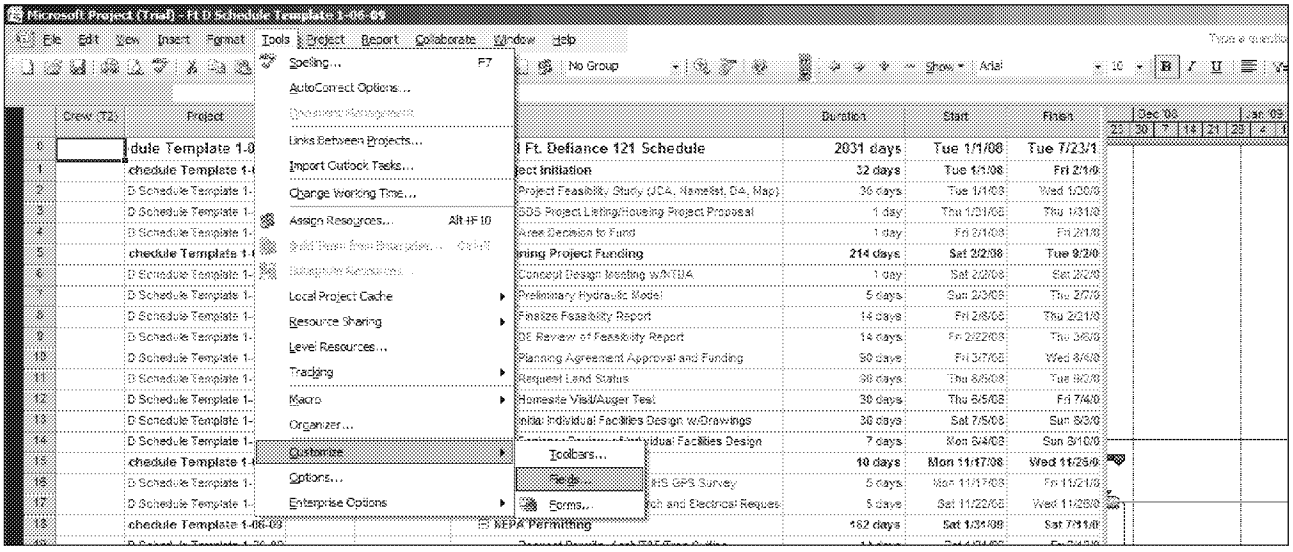
MS Project Template All STARS Milestones.mpp
MS Project Template HQ STARS Milestones.mpp

The Templates include the Custom Field Milestone Codes, which allow dates to be uploaded into PDS. They do not contain detailed task information such as durations, relationships, or resource assignments, etc.

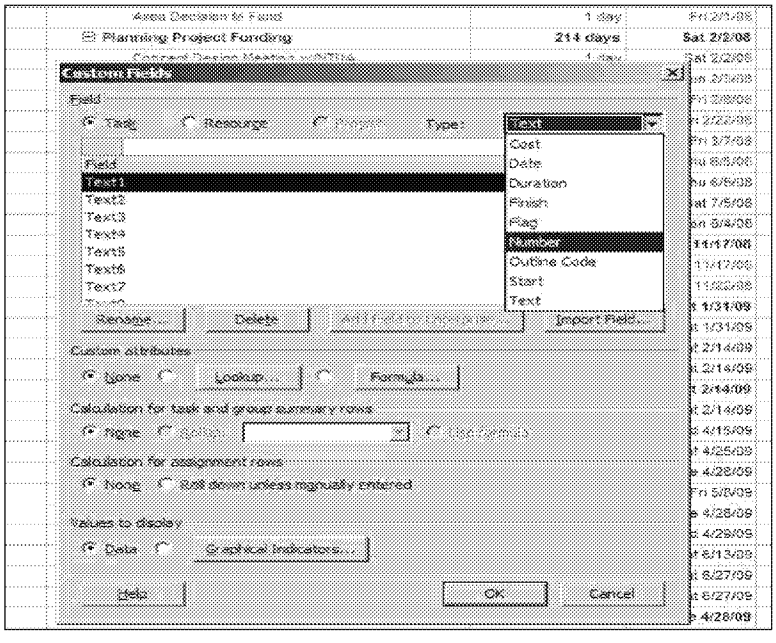
Formatting an existing MS Project File for Uploading to PDS

Steps to format an existing MS Project file so it can be uploaded into PDS are:

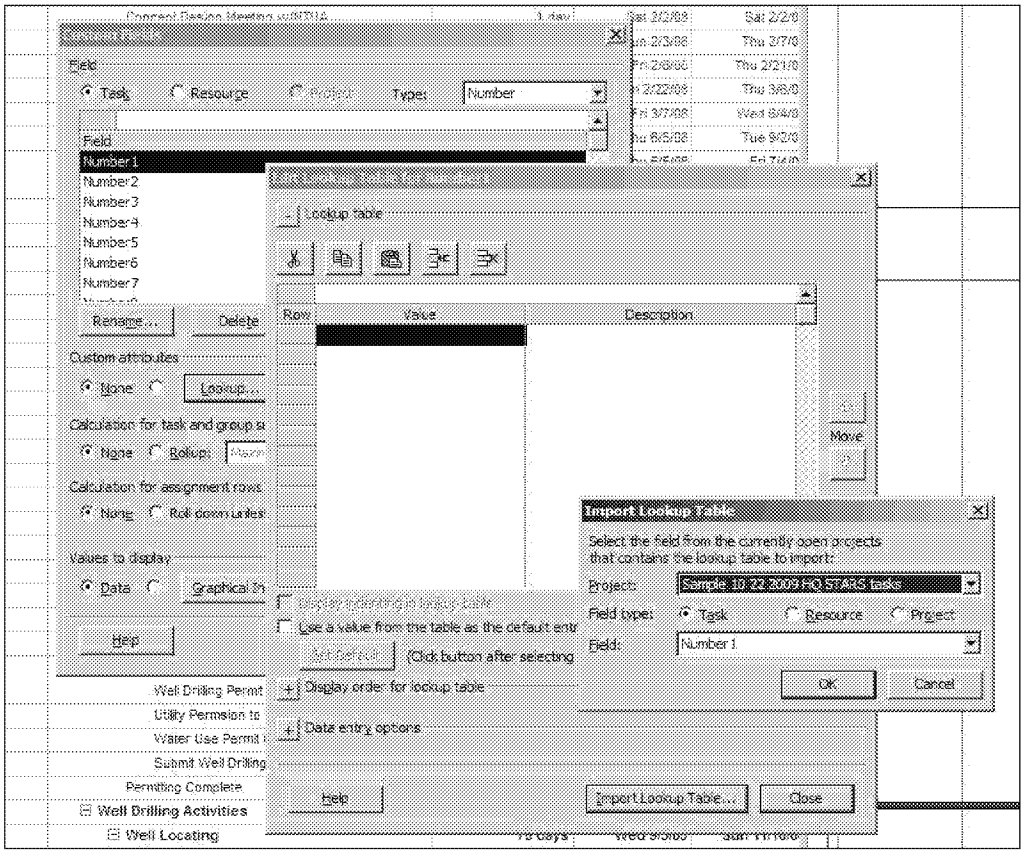
1. Open Template file that has Custom Fields lookup table
2. Open existing MS Project file, ***Tools; Customize; Fields;***



1. *Custom Fields; Number;*

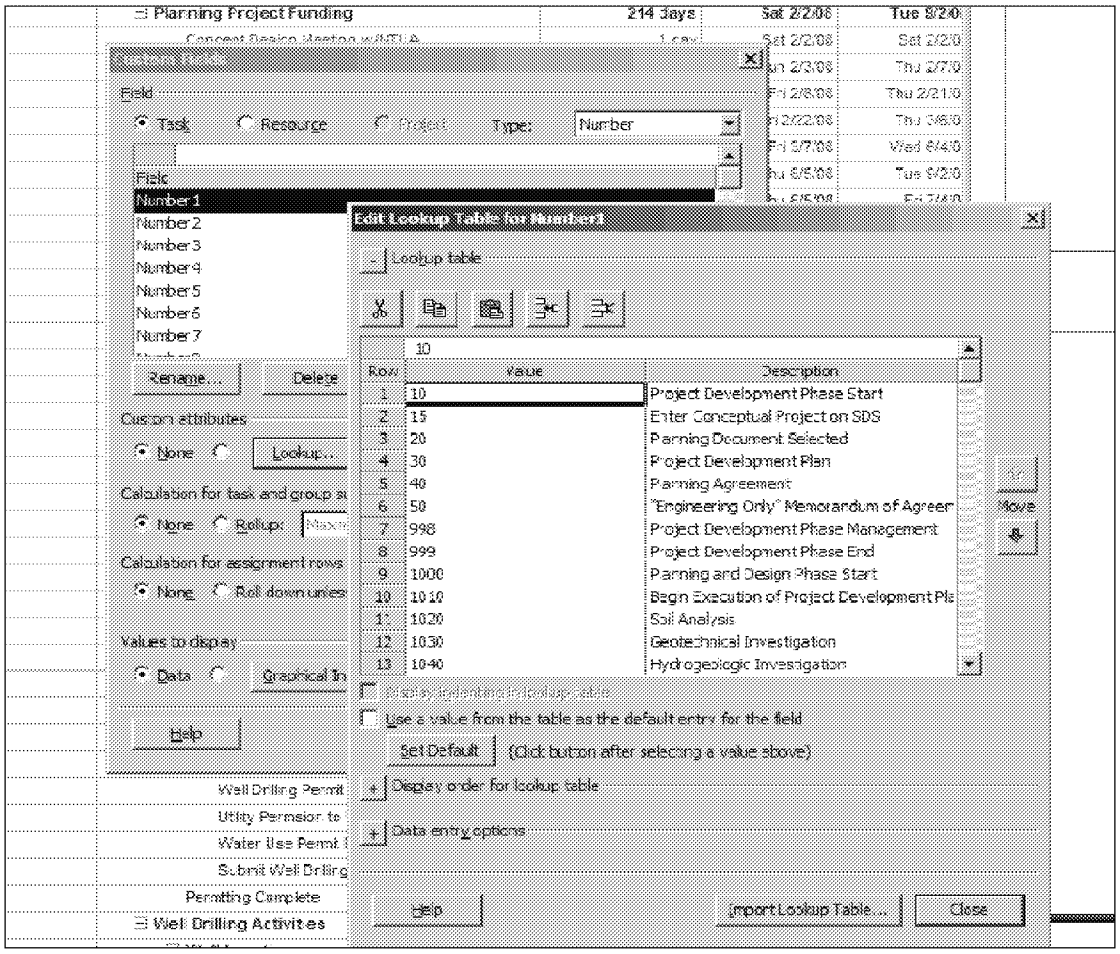


2. *Lookup; Import Lookup Table; MS Project Template…;*

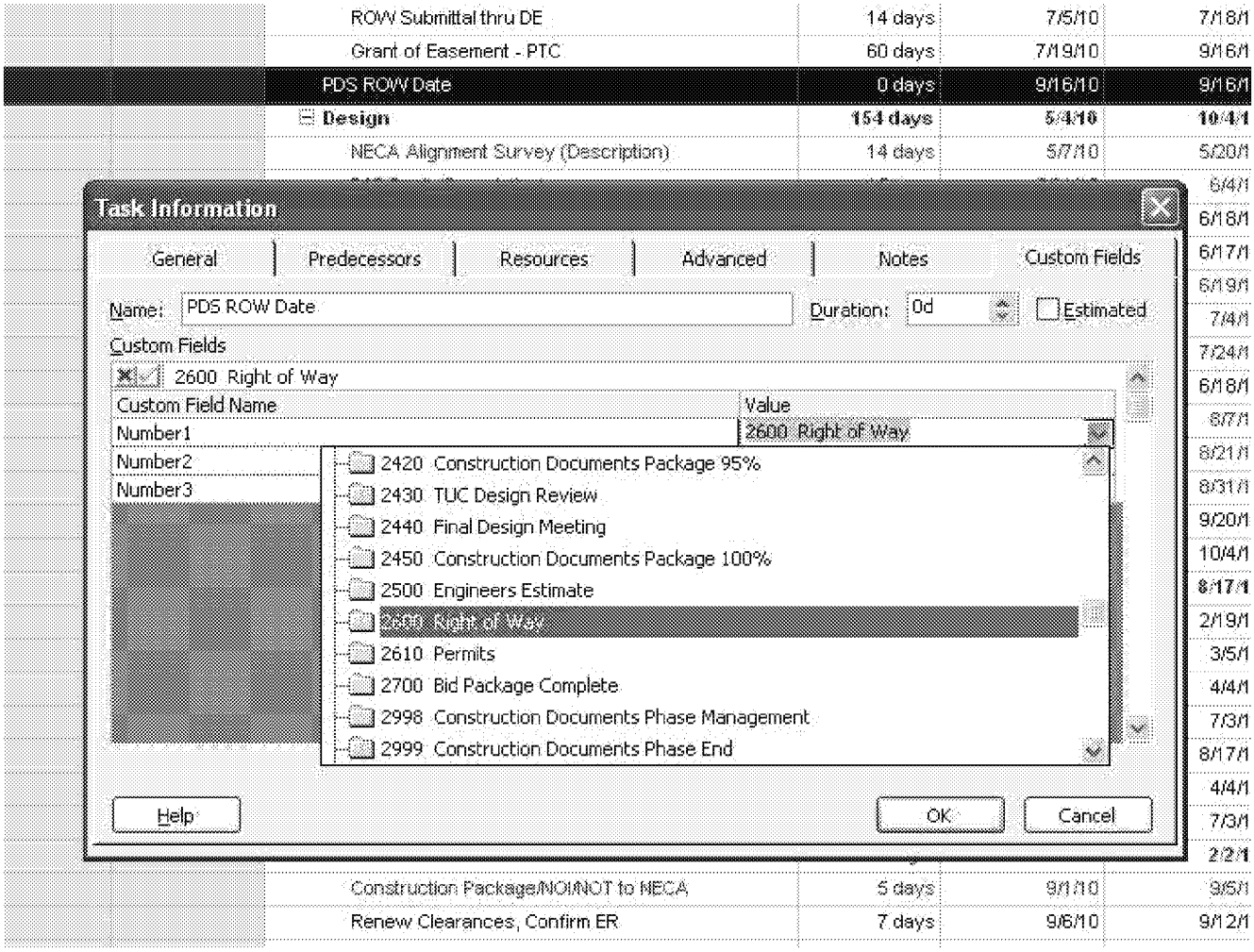


User Tip: Repeat step 4 above to create multiple custom fields (Number 1, Number 2, Number 3, etc.) if the existing MS Project file has a task that applies to more than one PDS Milestone. For example, perhaps a final inspection date in an MS Project file applies as both the following PDS Milestones - Final Inspection and Construction Phase End. Refer to any PDS guidance made available by your Area STARS Coordinator or District Engineer.

3. Lookup Table is now available in Project File to assign Values to Milestones



4. For each STARS Task to be uploaded to PDS, ***Assign the corresponding Custom Field Milestone Value(s)*** (only assign to those tasks being uploaded and reported in PDS)



When Custom Field values have been assigned to all PDS milestones, the file can be saved and be uploaded to PDS.

Saving an MS Project File and Uploading to PDS

After the MS Project File has been created with either a Template file or by assigning the Custom Field values to an existing file, the file can be saved in XML (Extensible Markup Language) format and then be uploaded to PDS. Naming convention for MS Project Files to be uploaded is similar to the Final Report naming convention: Area/Fiscal year/3 digit project number + .xml (Ex: **PH09D52.xml**).

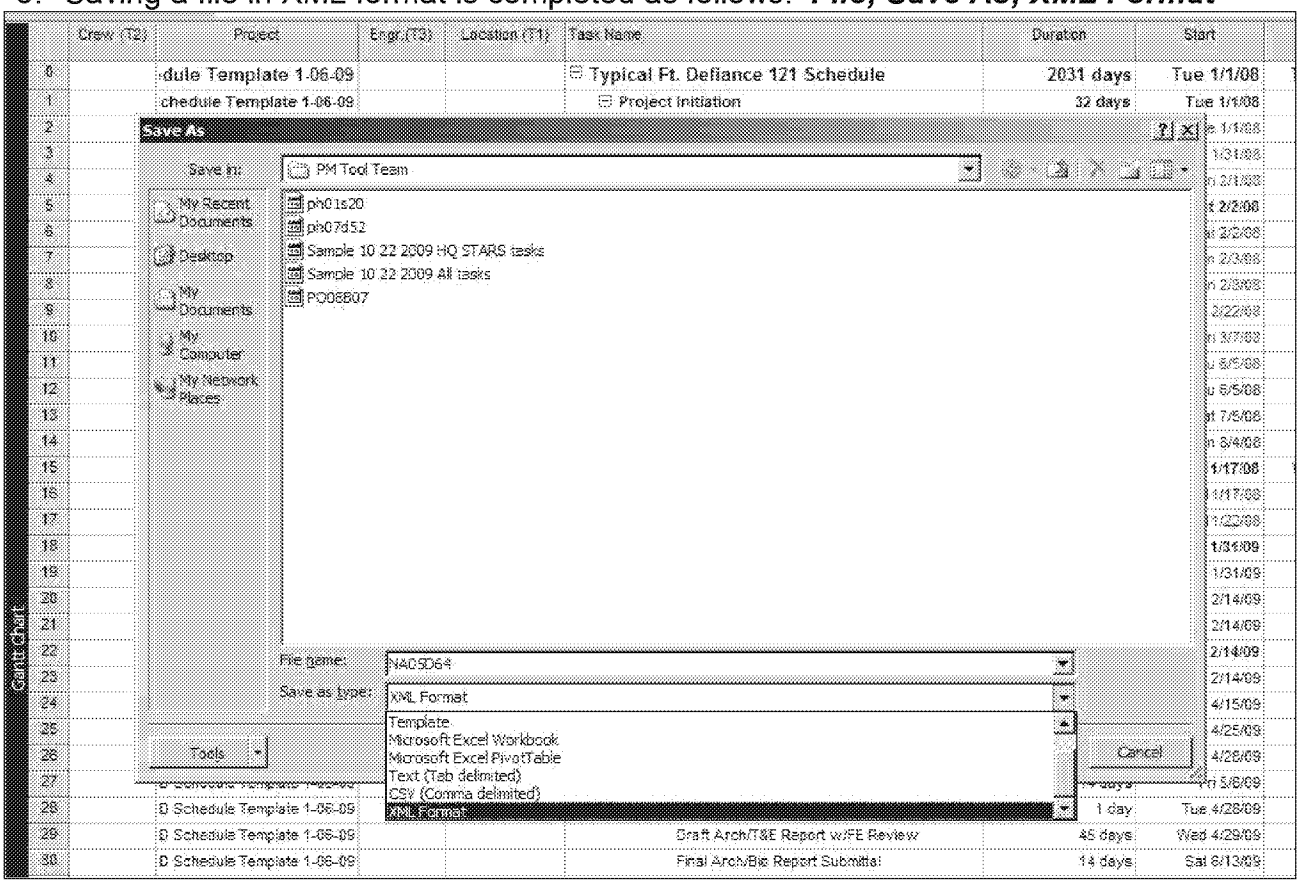
There are two options for saving and uploading MS Project Files.

1. **Save a single MS Project file and upload it to a single PDS Project.** The XML file name in this case only contains the single PDS project name (Ex: PH09D52.xml)

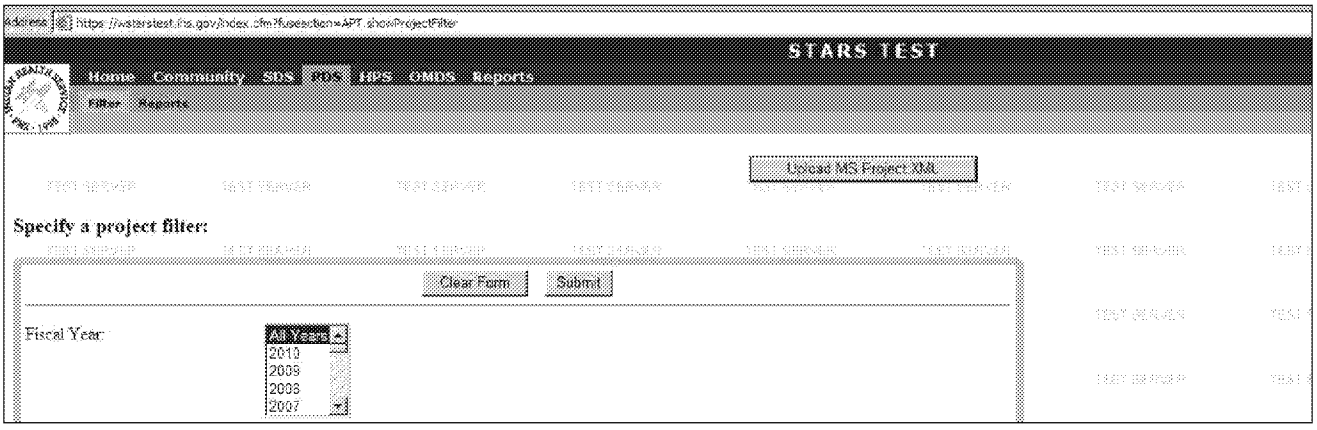
2. **Save a single MS Project file and upload it to more than one PDS Project.** This would be used if multiple PDS Projects are funding work under a common contract/agreement. The XML file name in this case contains multiple PDS project names (Ex: PH09D52 PH08D43.xml) with the names separated by a space.

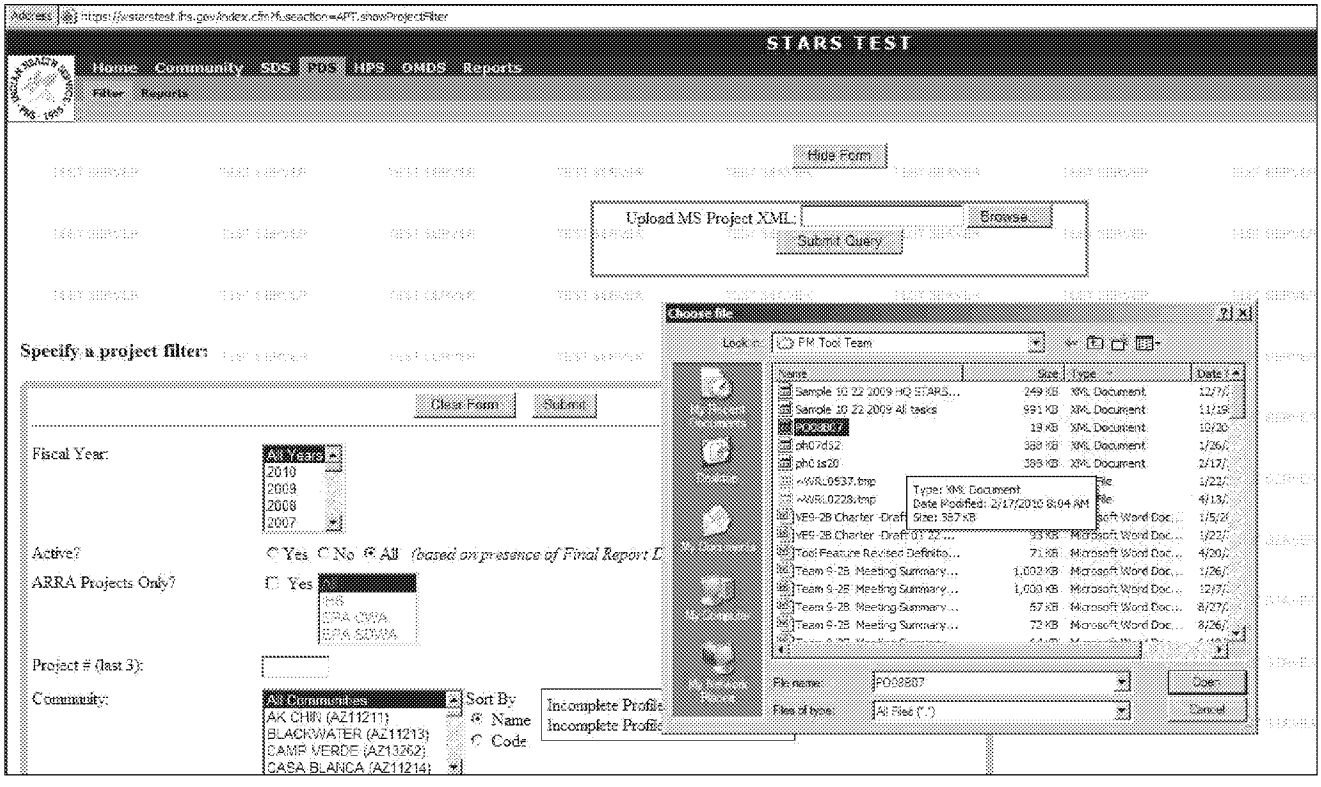
   A third option of combining multiple MS Project files as one file, and then saving as XML for upload was explored and it was found the resulting XML file was too large. This option may become available in the future.

3. Saving a file in XML format is completed as follows: ***File; Save As; XML Format***



Once a project is saved in XML format, it can be uploaded to PDS. ***Upload MS Project XML;***

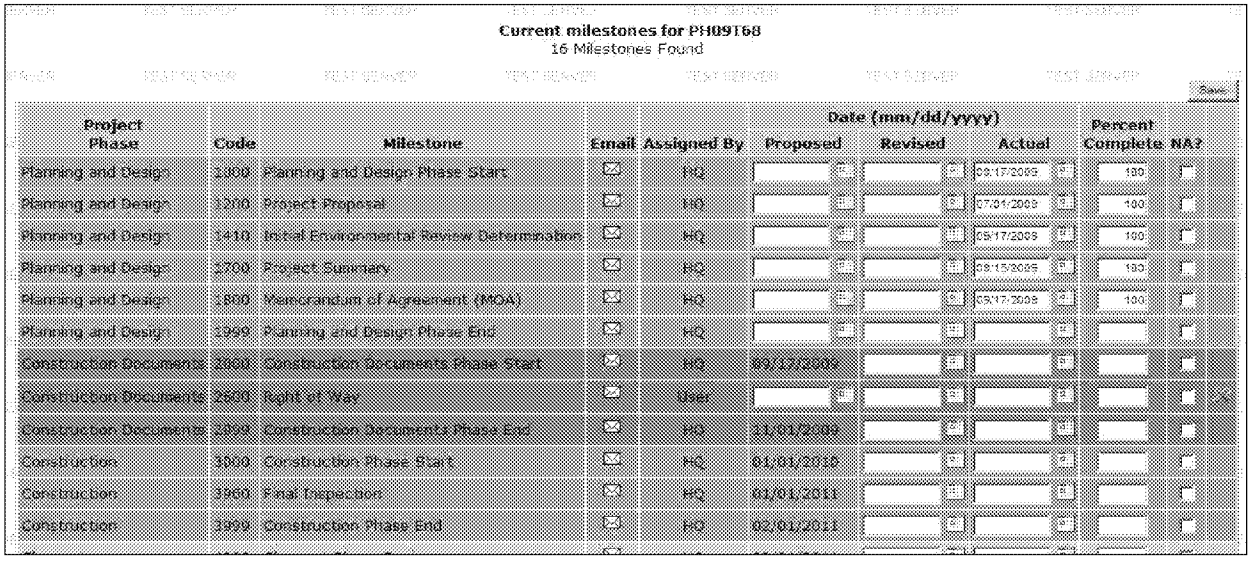




After this upload the dates from MS Project should be reflected in PDS.

Start and Finish Dates

In PDS every Milestone has Proposed, Revised, and Actual Finish dates, as illustrated below.



Current milestones for PH09168
16 Milestones Found

Project Phase	Code	Milestone	Email	Assigned By	Date (mm/dd/yyyy) Proposed	Revised	Actual	Percent Complete	NA?
Planning and Design	1000	Planning and Design Phase Start		HQ			08/17/2009	100	
Planning and Design	1200	Project Proposal		HQ			07/01/2009	100	
Planning and Design	1410	Initial Environmental Review Determination		HQ			08/17/2009	100	
Planning and Design	1700	Project Summary		HQ			08/15/2009	100	
Planning and Design	1800	Memorandum of Agreement (MOA)		HQ			08/17/2009	100	
Planning and Design	1999	Planning and Design Phase End		HQ					
Construction Documents	2000	Construction Documents Phase Start		HQ	09/17/2009				
Construction Documents	2600	Right of Way		User					
Construction Documents	2999	Construction Documents Phase End		HQ	11/01/2009				
Construction	3000	Construction Phase Start		HQ	01/01/2010				
Construction	3900	Final Inspection		HQ	01/01/2011				
Construction	3999	Construction Phase End		HQ	02/01/2011				

Recognizing that most MS Project files will not have these 3 finish dates, the upload process has been established to "translate" finish dates as follows:

MS Project		**STARS**
Baseline Finish (or Finish if no Baseline)	=	Proposed
Finish (if different than Proposed)	=	Revised
Actual Finish (100% Milestone)	=	Actual

So if a Project file has a "Baseline Finish" established, it will read this into PDS as the Proposed Milestone date. If there is no "Baseline Finish" in MS Project and only a "Finish" date, it will be read into the Proposed column in PDS until it changes, when it will then be read into the "Revised" column. The PDS Proposed will remain as it was prior to MS Project "Finish" being changed.

When a milestone is marked as complete (100% complete) in MS Project the Milestone date will be read into the "Actual" column in PDS. If the percent completion is less than 100% the Milestone date will be read as "Revised".